SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

B.E-Electrical and Electronics Engineering

CURRICULUM and SYLLABI

[For students admitted in 2019-2020]

B.E / B.Tech Regulation 2019

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester I under Regulations 2019 (CBCS)
Branch: Electrical and Electronics Engineering

S. No.	Course Code	Course Title	L	T	P	C	Category
Theory							
1	U19ENG101B	English for Engineers - I	1	0	2	2	HS
2	U19MAT102A	Linear Algebra and Calculus	3	1	0	4	BS
3	U19CHE104D	Chemistry for Electrical Engineers	3	0	0	3	BS
4	U19PPR105	Problem Solving using Python Programming	3	0	0	3	ES
5	U19EGR106	Engineering Graphics **	2	0	2	3	ES
Laboratory							
6	U19CHL109	Chemistry Laboratory	0	0	3	1.5	BS
7	U19PPL111	Python Programming Laboratory	0	0	2	1	ES
8	U19WPL112	Workshop Practice	0	0	2	1	ES
9	U19GE101	Basic Aptitude - I	0	0	2	0	EEC
Total Credits						18.5	
Optional Language Elective*							
10	U19OLE1101	French	0	0	2	1	HS
11	U19OLE1102	German					
12	U19OLE1103	Japanese					

***** Students may opt for foreign languages viz., German/French/Japanese with additional one credit

(Not accounted for CGPA calculation)

** The examination will be conducted for 3 hours through CAD software and manual drafting.

Approved By

Chairperson, Science and Humanities BoS	Chairperson, Electrical and Electronics Engineering BoS	Member Secretary, Academic Council	Chairperson, Academic Council & Principal
Dr.M.Renuga	**Dr.S.Padma**	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

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HOD / Electrical and Electronics Engineering, First Semester BE EEE Students and Staff, COE.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester II under Regulations 2019 (CBCS)
Branch: Electrical and Electronics Engineering

S. No.	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Category
		Theory					
1	U19ENG201B	English for Engineers - II	1	0	2	2	HS
2	U19MAT202C	Transforms and Differential Equations	3	1	0	4	BS
3	U19PHY203C	Physics for Electrical Engineers	3	1	0	4	BS
4	U19EE201	Electric Circuits and Electron Devices	3	1	0	4	PC
5	U19EE202	Measurements and Instrumentation	3	0	0	3	PC
		Laboratory					
6	U19PHL210	Physics Laboratory	0	0	3	1.5	BS
7	U19EE203	Electric Circuits and Electron Devices Laboratory	0	0	3	1.5	PC
8	U19GE201	Basic Aptitude - II	0	0	2	0	EEC
					Total Credits	20	
		Optional Language Elective*					
9	U19OLE1201	French	0	0	2	1	HS
10	U19OLE1202	German					
11	U19OLE1203	Japanese					

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	Chairperson, Electrical and Electronics Engineering BoS	Member Secretary, Academic Council	Chairperson, Academic Council & Principal
Dr.M.Renuga	Dr.S.Padma	Dr.R.Shivakumar	Dr.S.R.R.Senthil Kumar

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13.12.2019 B.E/B.Tech Regulations-2019

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester III under Regulations 2019
Branch: Electrical and Electronics Engineering

S. No.	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U19EE301	Network Analysis and Synthesis	3	1	0	4
2	U19EE302	Analog Electronics	3	0	0	3
3	U19EE303	Electromagnetic Fields	3	1	0	4
4	U19EE304	Electrical Machines – I	3	0	0	3
5	U19EE305	Applied Thermodynamics	3	0	0	3
6	U19CS309	Object Oriented Programming in C++	3	0	0	3
7	U19GE302	**Mandatory Course:** Environment and Climate Science	2	0	0	0
Practical						
8	U19EE306	Analog Electronics Laboratory	0	0	2	1
9	U19EE307	Electrical Machines Laboratory – I	0	0	2	1
10	U19CS310	Object Oriented Programming in C++ Laboratory	0	0	2	1
11	U19GE301	Soft Skills and Aptitude – I	0	0	2	1
					Total Credits	**24**

Approved By

Chairperson, Electrical and Electronics Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.S.Padma	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

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HOD/Electrical and Electronics Engineering, Third Semester BE EEE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV under Regulations 2019
Branch: Electrical and Electronics Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U19MAT401B	Probability and Statistical Methods	3	1	0	4
2	U19EE401	Signals and Systems	2	1	0	3
3	U19EE402	Electrical Machines – II	3	0	0	3
4	U19EE403	Power Electronics and Drives	3	0	0	3
5	U19EE404	Digital Electronics and Microcontroller	3	0	0	3
6	U19CS408	Data Structures	3	0	2	4
7	U19GE403	**Mandatory Course:** Essence of Indian Traditional Knowledge	2	0	0	0
Practical						
8	U19EE405	Electrical Machines Laboratory – II	0	0	2	1
9	U19EE406	Power Electronics and Drives Laboratory	0	0	2	1
10	U19EE407	Digital Electronics and Microcontroller Laboratory	0	0	3	1.5
11	U19GE401	Soft Skills and Aptitude - II	0	0	2	1
					Total Credits	**24.5**

Approved By

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Dr.S.Padma

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electrical and Electronics Engineering, Fourth Semester BE EEE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester V Regulations 2019
Branch: Electrical and Electronics Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19EE501	Generation, Transmission and Distribution Systems	2	1	0	3	45
2	U19EE502	Control Systems	2	1	0	3	45
3	U19EE503	Embedded Systems and IoT	3	0	0	3	45
4	U19EE504	Electrical Machine Design	2	1	0	3	45
5	U19EE505	Total Quality Management in Electrical Industries	3	0	0	3	45
6	noc21-ge23	Solar Energy Engineering and Technology	3	0	0	3	45
Practical							
7	U19EE506	Instrumentation and Control Laboratory	0	0	2	1	30
8	U19EE507	Embedded Systems and IoT Laboratory	0	0	2	1	30
9	U19GE501	Soft Skills and Aptitude – III	0	0	2	1	30
					Total Credits	**21**	

Approved By

Chairperson, Electrical and Electronics Engineering BoS Dr.S.Padma

Member Secretary, Academic Council Dr.R.Shivakumar

Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electrical and Electronics Engineering, Fifth Semester BE EEE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VI Regulations 2019
Branch: Electrical and Electronics Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19EE601	Power System Analysis	3	1	0	4	60
2	U19EE602	Power System Protection and Switchgear	3	0	0	3	45
3	U19EE603	Special Electrical Machines and their Controllers	3	0	0	3	45
4	U19EE918	**Elective** - Renewable Energy Sources	3	0	0	3	45
5	U19EE919	**Elective** - Power Quality Engineering	3	0	0	3	45
6	U19CS1002	**Open Elective** - Cloud Computing	3	0	0	3	45
	U19CS1004	**Open Elective** - Mobile Application Development					
	U19CS1006	**Open Elective** - Data Science					
	U19EC1003	**Open Elective** - Sensors and Smart Structures Technologies					
	U19EC1006	**Open Elective** - Mobile Technology and its Applications					
	U19EE1003	**Open Elective** - Innovation, IPR and Entrepreneurship Development					
	U19IT1001	**Open Elective** - Problem Solving Techniques using Java Programming					
	U19MC1003	**Open Elective** - Smart Automation					
Practical							
7	U19EE604	Mini Project	0	0	6	3	90
8	U19ENG601	Communication Skills Laboratory	0	0	2	1	30
9	U19GE601	Soft Skills and Aptitude - IV	0	0	2	1	30
Total Credits						**24**	

Approved By

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HOD/Electrical and Electronics Engineering, Sixth Semester BE EEE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VII under Regulations 2019
Branch: Electrical and Electronics Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19GE701	Professional Ethics and Human Values	3	0	0	3	45
2	U19EE914	**Professional Elective** – Advanced Electrical Drives	3	0	0	3	45
3	U19EE916	**Professional Elective** – Power System Operation and Control	3	0	0	3	45
4	U19EE923	**Professional Elective** – Electrical Energy Conservation and Auditing	3	0	0	3	45
5	U19CE1004	**Open Elective -** Disaster Management	3	0	0	3	45
	U19CS1001	**Open Elective -** Big Data Analytics					
	U19CS1002	**Open Elective -** Cloud Computing					
	U19CS1006	**Open Elective -** Data Science					
	U19EC1002	**Open Elective -** Embedded and Real Time Systems					
	U19EC1005	**Open Elective -** Signal and Image Processing					
	U19EC1007	**Open Elective -** CMOS VLSI Design					
	U19EE1003	**Open Elective -** Innovation, IPR and Entrepreneurship Development					
	U19FT1001	**Open Elective -** Fundamentals of Fashion Design					
	U19FT1002	**Open Elective -** Garment Manufacturing Technology					
	U19MC1003	**Open Elective -** Smart Automation					
	U19MC1004	**Open Elective -** Fundamentals of Robotics					
Practical							
6	U19EE701	Power Systems Laboratory	0	0	4	2	60
					Total Credits	**17**	

Approved By

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HOD/Electrical and Electronics Engineering, Seventh Semester BE EEE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VIII Regulations 2019
Branch: Electrical and Electronics Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Practical							
1	U19EE801	Project Work	0	0	24	12	360
					Total Credits	**12**	

Approved By

Chairperson, Electrical and Electronics Engineering BoS
Dr.S.Padma

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electrical and Electronics Engineering, Eighth Semester BE EEE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester I under Regulations 2019 (CBCS)
Branch: Electrical and Electronics Engineering

S. No.	Course Code	Course Title	L	T	P	C	Category
Theory							
1	U19ENG101B	English for Engineers - I	1	0	2	2	HS
2	U19MAT102A	Linear Algebra and Calculus	3	1	0	4	BS
3	U19CHE104D	Chemistry for Electrical Engineers	3	0	0	3	BS
4	U19PPR105	Problem Solving using Python Programming	3	0	0	3	ES
5	U19EGR106	Engineering Graphics **	2	0	2	3	ES
Laboratory							
6	U19CHL109	Chemistry Laboratory	0	0	3	1.5	BS
7	U19PPL111	Python Programming Laboratory	0	0	2	1	ES
8	U19WPL112	Workshop Practice	0	0	2	1	ES
9	U19GE101	Basic Aptitude - I	0	0	2	0	EEC
Total Credits						18.5	
Optional Language Elective*							
10	U19OLE1101	French	0	0	2	1	HS
11	U19OLE1102	German					
12	U19OLE1103	Japanese					

***** Students may opt for foreign languages viz., German/French/Japanese with additional one credit

(Not accounted for CGPA calculation)

** The examination will be conducted for 3 hours through CAD software and manual drafting.

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Copy to:-

HOD / Electrical and Electronics Engineering, First Semester BE EEE Students and Staff, COE.

U19ENG101B - ENGLISH FOR ENGINEERS – I
COMMON TO CSE, ECE, EEE, MCT, BME

L	T	P	C
1	0	2	2

Course Outcomes: At the end of course, the students will be able to

1. Use grammatical components effectively in both written and spoken communication
2. Develop speaking skills for self-introduction, delivering speeches and technical presentation.
3. Speak effectively in real time and business situations
4. Write email, formal letters and descriptions of graphics
5. Develop skills for writing reports and proposals, and for general purpose and technical writing.

UNIT I

- General Vocabulary, Parts of speech
- Self-introduction – personal information, name, home background, study details, area of interest, hobbies, strengths and weaknesses, projects and paper presentations, likes and dislikes in food, travel, clothes, special features of home town.
- Instructions, Email – fixing an appointment, cancelling appointments, conference details, hotel accommodation, order for equipment, training programme details, paper submission for seminars and conferences
- Paragraph writing – Describing – defining – providing examples or evidences

UNIT II

- Tenses, active and passive voice
- Welcome address, vote of thanks, special address on specific topic.
- Checklists, letter writing – business communication, quotations, placing orders, complaints, replies to queries from business customers, inviting dignitaries, accepting and declining invitations

UNIT III

- Prefixes and Suffixes
- Mini presentation in small groups of two or three on office arrangements, facilities, office functions, sales, purchases, training recruitment, advertising, applying for financial assistance, applying for a job, team work, discussion, presentation.
- Job application letter and resume, recommendations,

UNIT IV

- Modal verbs and probability, concord
- Situational Role Play - between examiner and candidate, teacher and student, customer and sales manager, hotel manager and organiser, team leader and team member, bank manager and candidate, interviewer and applicant, car driver and client, industrialist and candidate, receptionist and appointment seeker, new employee and manager, employee and employee, p.a. and manager, schedule for training
- Note making, Proposal

UNIT V

- If conditionals
- Situational Role Play - Asking for directions, seeking help with office equipment, clarifying an error in the bill, job details, buying a product, selling a product, designing a website, cancelling and fixing appointments, hotel accommodation, training facilities, dress code, conference facilities.
- Memo, technical report writing, feasibility reports, accident report, survey report

TOTAL: 45 hours

Speaking test will be conducted for 20 marks externally and evaluated along with English for Engineers – I in the End Semester Valuation.

Text Book

- Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016

Extensive Reading

- The Story of Amazon.com- Sara Gilbert, published by Jaico
- The Story of Google – Sara Gilbert, published by Jaico

Reference

- Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
- A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

U19MAT102A - LINEAR ALGEBRA AND CALCULUS
Common to CIVIL, MECH, EEE, CSE, IT and MCT

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the course, the students will be able to

- find the rank of the matrix and solve linear system of equations by direct and indirect methods
- apply the concepts of vector spaces and linear transformations in real world applications
- apply the concepts of eigen values and eigen vectors of a real matrix and their properties in diagonalization and the reduction of a real symmetric matrix from quadratic form to canonical form
- find the Taylor's series expansion, Jacobians and the maxima and minima of functions of two variables
- apply appropriate techniques of multiple integrals to find the area and volume.

UNIT I - LINEAR SYSTEM OF EQUATIONS **12**

Rank of a matrix – Solution of linear system of equations by matrix method, Gauss elimination, Gauss-Jordan, Gauss-Jacobi and Gauss-Seidel methods.

UNIT II - VECTOR SPACES **12**

Vector Space – Linear independence and dependence of vectors – Basis – Dimension – Linear transformations (maps) – Matrix associated with a linear map – Range and kernel of a linear map – Rank-nullity theorem (without proof).

UNIT III - EIGEN VALUES AND EIGEN VECTORS **12**

Eigen values and eigen vectors of real matrices – Properties of eigen values and eigen vectors – Cayley-Hamilton theorem – Diagonalization of real symmetric matrices – Reduction of quadratic form to canonical form.

UNIT IV - MULTIVARIABLE CALCULUS **12**

Functions of several variables – Partial differentiation – Total derivative – Jacobians – Taylor's theorem for function of two variables – Maxima and minima of function of two variables without constraints – Constrained maxima and minima by Lagrange's method of undetermined multipliers.

UNIT V - MULTIPLE INTEGRALS **12**

Double integrals – Change of order of integration – Change of variables from Cartesian to polar coordinates – Area as double integrals in Cartesian coordinates – Triple integrals – Volume as triple integrals in Cartesian coordinates.

Theory: 45 hours, Tutorial: 15 hours

TOTAL: 60 Hours

TEXT BOOKS

1. T. Veerarajan, "Linear Algebra and Partial Differential Equations", McGraw Hill Publishers, 1st Edition, 2018.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.

REFERENCE BOOKS

1. S. Lipschutz and M. L. Lipson, "Linear Algebra", McGraw Hill Publishers, 6th Edition, 2018.
2. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
3. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
4. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.
5. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.

U19CHE104D - CHEMISTRY FOR ELECTRICAL ENGINEERS

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to,

1. Analyze the types of polymers, polymerization reactions, polymerization techniques and fabrication methods of polymers for engineering applications.
2. Describe the construction, working principle and applications of energy storage devices for electronic appliances.
3. Discuss the principles, advantages and applications of organic electronic materials in electronic devices.
4. Explain the electrochemical processes carried out in electronic industries.
5. Outline the principle and process of fabrication of Integrated Circuits.

UNIT I - POLYMERS AND COMPOSITES 9

Nomenclature of Polymers – Functionality – Types of Polymerization-Addition-Condensation and Copolymerization – Classification of Polymers – Free Radical mechanism of addition polymerization - Tacticity in polymers – Methods of Polymerization-bulk-solution-emulsion and suspension – Plastics – Moulding constituents of plastic – Moulding of plastics into articles-Intrution, Compression and Blow moulding – Thermoplastic and Thermosetting Resins – Engineering Plastics-Nylon 6,6-Polycarbonate and Polyurethane-preparation-properties and applications – Composites-Constituents of composites – Types of composites – Rubbers-types-applications-vulcanization of rubber.

UNIT II - MODERN ENERGY DEVICES FOR ELECTRONIC APPLIANCES 9

Reversible and Irreversible Cells – Batteries-Types of Batteries – Battery Characteristics-Voltage-Current-Capacity-Electricity Storage Density-Power-Discharge Rate-Cycle Life-Energy Efficiency and Shelf Life – Fabrication and Working of Alkaline Battery-Lead-Acid Battery-Ni-Cd-Lithium Ion Batteries and Solar cells – Fuel Cells – Hydrogen-Oxygen fuel cell – Nano Batteries- Construction-Working-Advantages and Applications.

UNIT III - CHEMISTRY OF ORGANIC ELECTRONIC MATERIALS 9

Organic semiconducting materials – working principle and advantages over inorganic semiconducting materials - p-type and n-type organic semiconducting materials - Pentacene Fullerenes-C-60 – Organic dielectric material-definition-working principle and examples - Polystyrene – PMMA – Organic light emitting polymer – structure-properties and applications of Polythiopene – Conducting polymers, types and applications – Organic Light Emitting Diodes (Oleds) - construction-working principle and applications – Organic Solar Cells-working principle and applications organic transistors- construction-working principle and applications in electronic Industries.

UNIT IV - ELECTROCHEMICAL PROCESSES IN ELECTRONIC INDUSTRIES 9

Electroplating – Principle and process - plating parameters- current and energy efficiency - Electroplating of Cu, Ni, and Cr. Fundamentals of electroless deposition – Ni and Cu electroless plating, fabrication of PCB's - Electrochemical etching of copper from PCBs - Anodizing - Definition, Principle and working methodology of aluminium anodizing process - Chemical sensors - optical and heat sensors – definitions and applications.

UNIT V - FABRICATION OF INTEGRATED CIRCUITS 9

Introduction – Classification – IC chip size and circuit complexity – Fundamentals of monolithic IC technology – Basic planar process – Silicon wafer preparation, Epitaxial growth, X-ray and electron beam lithography, Diffusion, Isolation techniques, Metallization, Assembly processing and packaging – Fabrication of a typical circuit – Active and passive components of ICs – Transistors only.

TOTAL: 45 Hours

TEXT BOOKS

- P.C.Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi , 2010.
- M.Raja *et al.,* "Chemistry For Electrical and Electronics Engineering" Sonaversity, Sona College of Technology, Salem, New Edition, 2019.

REFERENCE BOOKS

- Gowariker V.R. , Viswanathan N.V. and Jayadev Sreedhar, “Polymer Science”, New Age International P (Ltd.,), Chennai, 2006
- Electroplating, Anodizing and Metal treatment”, Hand book, NIIR board, 2004.
- Hagen Klauk, “Organic Electronics: Materials, Manufacturing and Applications”, Wiley-VCH, 2006.
- D. Roy Choudhuryshail Jain, “Linear Integrated Circuits”, New age international publishers, 2000.

U19PPR105 - PROBLEM SOLVING USING PYTHON PROGRAMMING

L	T	P	C
3	0	0	3

Course Outcomes: At the end of course, the students will be able to

1. Develop algorithmic solutions to simple computational problems
2. Write simple Python programs
3. Write programs with the various control statements and handling strings in Python
4. Develop Python programs using functions and files
5. Analyze a problem and use appropriate data structures to solve it.

UNIT I - ALGORITHMIC PROBLEM SOLVING 9

Need for computer languages, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

UNIT II - BASICS OF PYTHON PROGRAMMING 9

Introduction-Python Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, input function, print function, Formatting numbers and strings, implicit/explicit type conversion.

UNIT III - CONTROL STATEMENTS AND STRINGS 9

Conditional (if), alternative (if-else), chained conditional (if-elif-else). Iteration-while, for, infinite loop, break, continue, pass, else. Strings-String slices, immutability, string methods and operations.

UNIT IV - FUNCTIONS AND FILES 9

Functions - Introduction, inbuilt functions, user defined functions, passing parameters - positional arguments, default arguments, keyword arguments, return values, local scope, global scope and recursion. Files -Text files, reading and writing files.

UNIT V - DATA STRUCTURES: LISTS, SETS, TUPLES, DICTIONARIES 9

Lists-creating lists, list operations, list methods, mutability list functions, searching and sorting, Sets-creating sets, set operations. Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Nested Dictionaries.

TOTAL: 45 Hours

TEXT BOOKS

- Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 2018.
- Allen B. Downey, "Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/)

REFERENCES

- Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python" , Mc-Graw Hill Education, 2018.
- Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
- Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
- Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
- Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2013.

U19EGR106 - ENGINEERING GRAPHICS

L	T	P	C
2	0	2	3

Course Outcomes: Upon completion of this course the students will be able to

CO1 Predict the construction of various curves in civil elevation, plan and machine components.

CO2 Analyze the principles of projection of various planes by different angle to project points, lines and planes.

CO3 Draw the principles of projection of simple solid by the axis is inclined to one reference plane by change of position method.

CO4 Understand the interior details of complex components, machineries by sectioning the solid body. Study the development of surfaces for prisms and pyramids.

CO5 Draw the projection of three dimensional objects representation of machine structure and explain standards of orthographic views by different methods.

CONCEPTS AND CONVENTIONS (Not for Examination) **L 3**

Importance of graphics in engineering applications, Use of drafting instrument, BIS conventions and specifications - Size, layout and folding of drawing sheets, Lettering and dimensioning.

COMPUTER AIDED DRAFTING (Not for Examination) **L 3**

Importance 2d Drafting, sketching, modifying, transforming and dimensioning.

UNIT I - PLANE CURVES (Manual drafting) **L 6**

Curves used in engineering practices Conics – Construction of ellipse – Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT II - PROJECTION OF POINTS, LINES AND PLANE SURFACES (CAD Software) **L 12**

Projection of points – Projection of straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to one reference planes.

UNIT III - PROJECTION OF SOLIDS L 12

(CAD Software)

Creation of 3D CAD models of pyramids, prisms and solids of revolutions - Sectional views - **(Not for Examination)**

Projection of simple solids like prisms – pyramids – cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV - SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES L 12

(CAD Software)

Sectioning of simple solids like prisms – pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, (Obtaining true shape of section is not required). Development of lateral surfaces of simple and truncated solids – Prisms – pyramids – cylinders and cones.

UNIT V - CONVERSION OF ISOMETRIC VIEWS TO ORTHOGRAPHIC VIEWS L 12

(Manual drafting)

Representation of three dimensional objects – General Principles of Orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout of views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

TOTAL: 60 Hours

TEXT BOOKS

- P. Suresh et al., "Engineering Graphics and Drawing", Sonaversity, Sona College of Technology, Salem, Revised edition, 2012.
- K.V. Natarajan Engineering Graphics by, Chennai, 17th edition 2003.

REFERENCE BOOKS

- Dhananjay A. JoIhe, Engineering Drawing with an introduction to AutoCAD, Tata McGraw Hill Publishing Company Limited, 2008.
- Basant Agarwal and Agarwal C.M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
- K. R. Gopalakrishnana, Engineering Drawing (Vol. I & II), Subhas Publications, 1998.
- Bertoline & Wiebe fundamentals of graphics communication III edition McGrawhill 2002.

U19CHL109 - CHEMISTRY LABORATORY

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the course, the students will be able to,

- Estimate the amount of total, temporary and permanent hardness in the given water sample.
- Analyse the different types of alkalinity and determine their amount in the given water sample.
- Analyse the two given water samples and find which one possesses more chloride content in the given water samples by argentometric method.
- Analyse the two given brass samples and find which one possesses more copper content in the brass samples.
- Estimate the amount of hydrochloric acid present in the given solution using pH metry.
- Evaluate the iron content of the water by spectrophotometry.
- Estimate the amount of hydrochloric acid present in the given solution using conductivity meter.
- Estimate the amount of hydrochloric acid and acetic acid present in the given solution using conductivity meter.
- Describe the estimation of ferrous iron present in the given solution using potentiometer.
- Describe the method of determining the molecular weight of a given polymer.
- Analyse the two given water samples and find which one possesses more dissolved oxygen in the given water samples by Winkler's method.
- Analyse the two given waste waters and find which one possesses more chromium content.

List of Experiments

1. Estimation of hardness of water sample by EDTA method.
2. Estimation of alkalinity of water sample by indicator method.
3. Estimation of chloride ion present in the sample water by argentometric method.
4. Estimation of copper in brass by EDTA method.
5. Estimation of HCl by pH metry.
6. Determination of iron content in water by spectrophotometric method.
7. Estimation of HCl by conductometry. (HCl vs NaOH)
8. Estimation of mixture of acids by conductometry. (HCl + CH_3COOH vs NaOH)

9. Estimation of ferrous ion by potentiometric titration.
10. Determination of Molecular weight of a polymer by viscosity measurements.
11. Determination of Dissolved Oxygen of water by Winkler's method.
12. Estimation of chromium in waste water.

Total: 45 Hours

U19PPL111 - PYTHON PROGRAMMING LABORATORY

L	T	P	C
0	0	2	1

Course Outcomes: At the end of course, the students will be able to

1. Implement the algorithms using basic control structures in Python
2. Develop Python programs to use functions, strings and data structures to solve different types of problems
3. Implement persistent storing information through file operations

LIST OF EXPERIMENTS

1. Draw flowchart using any open source software.
2. Implement programs with simple language features.
3. Implement various branching statements in python.
4. Implement various looping statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, indexing.
6. Implement user defined functions using python.
7. Implement recursion using python.
8. Develop python programs to perform operations on list and tuples
9. Implement dictionary and set in python
10. Implement python program to perform file operations.

TOTAL: 30 Hours

U19WPL112 - WORKSHOP PRACTICE

L	T	P	C
0	0	2	1

Course Outcomes: Upon completion of this course the students will be able to

CO1 Familiarize with the basic of tools and equipment's used in fitting, carpentry, welding and sheet metal.

CO2 Fabricate the different simple products in above trades.

CO3 Produce different joining of metals.

LIST OF EXPERIMENTS

SECTION 1: FITTING

Tools and Equipment's- Practice in filling.

Making of Vee joint and square (T-fitting) joint.

SECTION 2: SHEET METAL

Tools and Equipment's- Practice

Making of Dust Pan and Funnel.

SECTION 3: WELDING

Tools and Equipment's – Practice

Arc welding of Butt joint and Lap Joint.

SECTION 4: CARPENTRY

Tools and Equipment's- Planning Practice

Making of Half Lap joint and Dovetail Joint.

TOTAL: 30 Hours

U19GE101 - BASIC APTITUDE – I
(Common to All Departments)

L	T	P	C
0	0	2	0

Course Outcomes: At the end of course, the students will be able to

1. Solve fundamental problems in specific areas of quantitative aptitude
2. Solve basic problems in stated areas of logical reasoning
3. Demonstrate rudimentary verbal aptitude skills in English with regard to specific topics

1. Quantitative Aptitude and Logical Reasoning

Solving simple problems with reference to the following topics:

a. Numbers – HCF & LCM
b. Decimal fractions
c. Square roots & cube roots
d. Surds & Indices
e. Logarithms
f. Percentage
g. Averages
h. Coding and Decoding & Visual language

2. Verbal Aptitude

Demonstrating plain English language skills with reference to the following topics:

a. Synonyms
b. Antonyms
c. Verbal analogy
d. Editing passages
e. Sentence filler words

TOTAL: 30 hours

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester II under Regulations 2019 (CBCS)
Branch: Electrical and Electronics Engineering

S. No.	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Category
		Theory					
1	U19ENG201B	English for Engineers - II	1	0	2	2	HS
2	U19MAT202C	Transforms and Differential Equations	3	1	0	4	BS
3	U19PHY203C	Physics for Electrical Engineers	3	1	0	4	BS
4	U19EE201	Electric Circuits and Electron Devices	3	1	0	4	PC
5	U19EE202	Measurements and Instrumentation	3	0	0	3	PC
		Laboratory					
6	U19PHL210	Physics Laboratory	0	0	3	1.5	BS
7	U19EE203	Electric Circuits and Electron Devices Laboratory	0	0	3	1.5	PC
8	U19GE201	Basic Aptitude - II	0	0	2	0	EEC
					Total Credits	20	
		Optional Language Elective*					
9	U19OLE1201	French	0	0	2	1	HS
10	U19OLE1202	German					
11	U19OLE1203	Japanese					

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	Chairperson, Electrical and Electronics Engineering BoS	Member Secretary, Academic Council	Chairperson, Academic Council & Principal
Dr.M.Renuga	Dr.S.Padma	Dr.R.Shivakumar	Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/ Electrical and Electronics Engineering, Second Semester BE EEE Students and Staff, COE

13.12.2019 B.E/B.Tech Regulations-2019

U19ENG201B - ENGLISH FOR ENGINEERS – II

L	T	P	C
1	0	2	2

Course Outcome: At the end of the course, the students will be able to

1. frame sentences correctly, both in written and spoken forms of language with accuracy and fluency.
2. develop and demonstrate listening skills for academic and professional purposes.
3. draw conclusions on explicit and implicit oral information.
4. develop effective reading skills and reinforce language skills required for using grammar and building vocabulary.
5. read for gathering and understanding information, following directions and giving responses.

UNIT - I

- Cause and effect expressions, adjectives, comparative adjectives
- Listening to conversations, welcome speeches, lectures and description of equipment
- Listening to different kinds of interviews (face-to-face, radio, TV and telephone interviews)
- Understanding notices, messages, timetables, advertisements, graphs, etc.
- Reading passages for specific information transfer

UNIT - II

- Prepositions and dependent prepositions
- Understanding short conversations or monologues,
- Taking down phone messages, orders, notes etc
- Listening for gist, identifying topic, context or function
- Reading documents for business and general contexts and interpreting graphical representations

UNIT - III

- Collocations
- Listening comprehension, entering information in tabular form
- Error correction, editing mistakes in grammar, vocabulary, spelling, etc.
- Reading passage with multiple choice questions, reading for gist and reading for specific information, skimming for comprehending the general idea and meaning and contents of the whole text

UNIT - IV

- Articles, adverbs
- Intensive listening exercises and completing the steps of a process.
- Listening exercises to categorise data in tables.
- Short reading passage: gap-filling exercise related to grammar, testing the understanding of prepositions, articles, auxiliary verbs, modal verbs, pronouns, relative pronouns and adverbs, short reading passage with multiple choice questions.

UNIT - V

- Pronouns
- Listening to extended speech for detail and inference
- Listening and developing hints
- Gap-filling exercise testing the knowledge of vocabulary, collocations, dependent prepositions
- Short reading passages for sentence matching exercises, picking out specific information in a short text

TOTAL: 30 Hours

The listening test will be conducted for 20 marks and reading for 20 marks internally and evaluated along with English for Engineers II in the End Semester Valuation.

TEXT BOOK

1. Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016

EXTENSIVE READING

1. Who Moved my Cheese? – Spencer Johnson-G. P. Putnam's Sons
2. Discover the Diamond in You – Arindham Chaudhari – Vikas Publishing House Pvt. Ltd

REFERENCES

1. Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
2. A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

U19MAT202C - TRANSFORMS AND DIFFERENTIAL EQUATIONS

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the course, the students will be able to

1. apply the classical method to solve linear ordinary differential equations with constant coefficients.
2. apply the Laplace transforms technique and its properties to solve an ordinary differential equation.
3. express a periodic signal as an infinite sum of sine and cosine wave components using Fourier series.
4. apply the Fourier transform techniques to convert the signal in terms of the frequencies of the waves.
5. find the general and singular solutions of linear and nonlinear partial differential equations.

UNIT I - ORDINARY DIFFERENTIAL EQUATIONS **12**

Linear higher order ordinary differential equations with constant coefficients – Cauchy's and Legendre's homogeneous linear ordinary differential equations – Method of variation of parameters.

UNIT II - LAPLACE TRANSFORMS **12**

Laplace transform: Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse function – Initial and final value theorems – Transform of periodic functions.

Inverse Laplace transform: Standard results – Statement of convolution theorem and its applications – Solution of linear second order ordinary differential equations with constant coefficients using Laplace transform.

UNIT III - FOURIER SERIES **12**

General Fourier series – Dirichlet's conditions – Change of intervals – Odd and even functions – Half range sine and cosine series – Root mean square – Parseval's identity – Harmonic analysis.

UNIT IV - FOURIER TRANSFORMS **12**

Fourier transform pair – Properties – Fourier sine and cosine transforms pair – Properties –Transforms of simple functions – Parseval's identity.

UNIT V - PARTIAL DIFFERENTIAL EQUATIONS **12**

Formation of partial differential equations – Lagrange's partial differential equation – Clairaut's form of partial differential equations – Higher order linear partial differential equation with constant coefficients.

TOTAL: 60 Hours

TEXT BOOKS

1. T. Veerarajan, "Transforms and Partial Differential Equations", McGraw Hill Publishers, 3rd Edition, 2016.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.

REFERENCES

1. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
2. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.
4. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.

U19PHY203C - PHYSICS FOR ELECTRICAL ENGINEERS

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the course, the students will be able to

1. discuss the dual nature of matter and radiation and its applications.
2. differentiate the electrical and thermal conductivity of metals.
3. elucidate the classification and theory of semiconducting materials.
4. explain the basics of electron devices and their applications.
5. elucidate the principle of optical fiber communication and their applications.

UNIT I - QUANTUM PHYSICS **12**

Particle nature of radiation: Drawbacks of classical theory-Origin of quantum mechanics-Dual nature of matter and radiation - Particle nature of radiation - Black body radiation-Planck Hypothesis - Planck radiation formula (no derivation) – Compton effect – Explanation based on quantum theory-Expression for Compton shift (no derivation) –Wave nature of matter - de Broglie waves - Schrödinger's time independent and time dependent wave equations- Physical significance of wave function-Energy and wave function of an electron trapped in one dimensional box.

Application of wave nature of particle- Electron microscope- Comparison of optical and electron microscope - Transmission electron microscope – Scanning electron microscope- Limitations of electron microscope

UNIT II - CONDUCTING MATERIALS **12**

Basics of conducting materials: Usage of conducting materials – basic definitions (electrical resistance-conductance-resistivity - conductivity) - classical free electron theory of metals – postulates of classical free electron theory – microscopic form of Ohm's law - Electrical conductivity - definition and expression for electrical conductivity- thermal conductivity – definition and expression for thermal conductivity - Wiedemann – Franz law and Lorentz number – Success and failure of classical free electron theory.

Quantum free electron theory: Drawbacks of quantum free electron theory- origin of energy bands -band theory of solids (qualitative treatment only) – Fermi energy and Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – carrier concentration in metals.

UNIT III - SEMICONDUCTOR PHYSICS 12

Fundamentals of semiconductors: Properties of semiconductors-Classification of semiconductors – Intrinsic and extrinsic semiconductors - Elemental and compound semiconductors.

Intrinsic semiconductor: Two types of charge carriers - Energy band diagram of intrinsic semiconductors (at T= 0 K and T > 0 K) – Expression for number of electrons in conduction band-Expression for number of holes in valence band - Law of mass action and intrinsic carrier concentration - Fermi level and its uses - Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination– Draw backs of intrinsic semiconductors

Extrinsic semiconductors: Types of extrinsic semiconductors – 'n'-type and 'p'-type semiconductors – Energy band diagram of 'n' type and 'p' type semiconductors (at T= 0 K and T > 0 K) – carrier concentration of extrinsic semiconductors (Qualitative Treatment only) – variation of Fermi level with temperature and impurity concentration – Hall effect –Determination of Hall coefficient – Applications.

UNIT IV - PN JUNCTION DIODE AND OPTOELECTRONIC DEVICES 12

Theory of diode: Formation of p-n junction - p-n junction diode- p-n junction diode under forward bias- p-n junction diode under reverse bias- Half wave rectifier- full wave rectifier- bridge rectifier-Zener diode

Display devices: Photo diodes- types of photo diodes- Photo detector-PIN diode-Avalanche photo diode-Light emitting diode (LED) – Liquid Crystal Display (LCD) principle, construction and working - Solar cell- principle –construction- working-Photo conductive cell –structure and operation, V I characteristics of photo transistor, Opto coupler, DIAC, TRIAC & CCD

UNIT - V FIBER OPTICS 12

Optical communication system: Fiber optics-Significance of optical fibers- Basic terms (reflection, refraction, refractive index, Snell's law, total internal reflection) – Derivation for acceptance angle, numerical aperture and fractional index change-Classification of fibers (based on materials, number of modes and refractive index profile)

Optical fiber communication: Block diagram of optical fiber communication-Advantages of optical fiber communication- Fiber optic sensors (Temperature and displacement sensors).

TOTAL: 60 Hours

TEXT BOOKS

1. M.N.Avadhanulu, 'Engineering Physics' S.Chand &Company Ltd, New Delhi (2015)
2. D. K. Bhattacharya, Poonam Tandon "Engineering Physics" Oxford University Press 2017.

REFERENCES

1. Engineering Physics, Sona College of Technology, Salem (Revised Edition 2016).
2. Physics for Electrical and Electronics Engineering, Sonaversity, Sona College of Technology, Salem (Revised Edition 2016).
3. Rajendran, V, and Marikani A, 'Materials science' TMH Publications, (2004) New Delhi.
4. Palanisamy P.K, 'Materials science', SciTech Publications (India) Pvt. Ltd., Chennai, Second Edition (2007)

U19EE201 - ELECTRIC CIRCUITS AND ELECTRON DEVICES

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the course, the students will be able to

1. discuss the DC and AC fundamentals of electric circuits.
2. solve the complex circuits using mesh analysis, nodal analysis and network theorems.
3. analyse resonance circuits and solve problems on three phase balanced and unbalanced loads.
4. discuss the configurations and analyse the performance of BJT, UJT JFET, MOSFET and IGBT.
5. analyse the applications of electron devices.

UNIT I - DC AND AC FUNDAMENTALS 12

DC fundamentals – resistance in series and parallel circuits - star – delta conversions – voltage and current divisions, source transformations - problems.

AC fundamentals – RMS and average values of sinusoidal waveform - RL, RC and RLC series circuits-problems.

UNIT II - NETWORK ANALYSIS AND THEOREMS 12

Mesh current and node voltage analysis - Superposition theorem -Thevenin's and Norton's theorems – Maximum power transfer theorem – Reciprocity theorem - problems (only DC networks).

UNIT III - RESONANCE AND THREE PHASE CIRCUITS 12

Series and parallel resonance – Frequency response – quality factor and bandwidth-three phase balanced and unbalanced systems – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads– power and power factor measurements in three phase circuits by two wattmeter method -problems.

UNIT IV - TRANSISTOR 12

Principle of operation of NPN and PNP transistors-transistor as an amplifier-study of CE,CB and CC configurations and characteristics - comparison - relationship between

amplification factors - operation and characteristics of UJT, JFET and MOSFET– working principle of IGBT - comparison of BJT with JFET and MOSFET.

UNIT V - ELECTRON DEVICES AND THEIR APPLICATIONS 12

Construction and characteristics of SCR and its two transistor analogy –SCR triggering methods-construction and operation of DIAC and TRIAC - comparison of SCR with DIAC and TRIAC -SCR as rectifier and inverter (single phase) - chopper – types of chopper- control strategies of chopper - cycloconverter.

TOTAL: 60 Hours

TEXT BOOKS

1. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill Education (India) Private Limited, New Delhi (2015).
2. Padma S, Senthil Kumar M, Sabeenian R.S and Paramasivam M.E, "Electric Circuits and Electron Devices" Sonaversity (2008).

REFERENCES

1. Arumugam M and Premakumaran N, "Electric Circuit Theory", Khanna Publishers, 12th edition, (2017).
2. Chakrabarti A, "Circuit Theory Analysis and synthesis", Dhanpath Rai & Sons, 7th edition, New Delhi, (2018).
3. Salivahanan S, Suresh Kumar N and "Electronic Devices and Circuits", McGraw Hill Education (India) Private Limited, 4th edition, New Delhi (2016).
4. Bimbhra P.S, "Power Electronics", Khanna Publishers, 6th edition, New Delhi (2018).

U19EE202 - MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the students will be able to

1. discuss the static and dynamic characteristics and define various errors.
2. derive torque equation for different types of meters.
3. calculate R, L, and C using bridges.
4. explain types of transducers storage and display devices.
5. explain data acquisition systems using transducers and sensors.

UNIT I - INTRODUCTION 9

Functional elements of an instrument – static characteristics: true value, static error, static correction, reproducibility, drift, repeatability, noise, signal to noise ratio, accuracy and precision, sensitivity, linearity, threshold, dead zone, resolution. Dynamic characteristics: speed of response, fidelity, lag, and dynamic error – errors: gross error, systematic error and random error – statistical evaluation of measurement data – standards and calibration.

UNIT II - ELECTRICAL AND ELECTRONICS INSTRUMENTS 9

Principle and operation of analog voltmeters and ammeters: moving iron: attraction and repulsion type instruments. Moving coil instruments; PMMC, dynamometer type, torque equation – single phase dynamometer type watt meter: torque expression, errors – single phase induction type energy meters – measurement of power using instrument transformers – single phase electro-dynamometer power factor meters and Weston frequency meter.

UNIT III - BRIDGES & INTERFERENCE TECHNIQUES 9

DC bridges: Wheatstone bridge, Kelvin double bridge – AC bridges: Anderson, Schering, Wein - interference & screening – grounding techniques – Measurement of earth resistance.

UNIT IV - DIGITAL INSTRUMENTS AND DISPLAY DEVICES 9

Digital voltmeter: ramp, integrating and successive approximation – Digital multi-meter – Dot matrix display, LED and LCD display, digital energy meter, Digital

Storage Oscilloscope (DSO) – digital printers and plotters – Recorders: X-Y graphic recorders - Special instruments: measurement of solar radiation and Wind velocity.

UNIT V - TRANSDUCERS AND SENSORS **9**

Transducers – selection of transducers – resistive, capacitive and inductive transducers – measurement of temperature – RTD, thermistors and thermocouples – piezoelectric transducers – digital transducers – optical encoders – Introduction to data acquisition – Sensors: Temperature, Infrared.

TOTAL: 60 Hours

TEXT BOOKS

1. A.K.Sawhney, "A Course in Electrical & Electronic Measurements &Instrumentation", DhanpatRai and Co, 7th Edition, 2015.
2. R.K.Rajput, "Electrical Measurements and Measuring Instruments", S.Chand and Company Pvt. Ltd., Second Edition, 2013.

REFERENCES

1. E.O.Doebelin, "Measurement Systems – Application and Design", Tata McGraw Hill Publishing company, 2003.
2. D.V.S. Moorthy, "Transducers and Instrumentation", Prentice Hall of India Pvt Ltd, 2007.
3. J. B. Gupta, "A Course in Electronic and Electrical Measurements", S. K. Kataria & Sons, Delhi, 2003.

U19PHL210 - PHYSICS LABORATORY

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the course, the students will be able to

1. apply the principles of optics and elasticity to determine the Engineering properties of materials.
2. apply the principles of electronics, electricity and thermal physics to determine the Engineering properties of materials.
3. determine the resistivity of the given fuse wire used for house hold applications.

List of Experiments

1. Determination of the thickness of a thin wire by forming interference fringes using air wedge apparatus.
2. Determination of velocity of ultrasonic waves and compressibility of the given liquid using ultrasonic interferometer.
3. Determination of dispersive power of the prism for various pairs of colors in the mercury spectrum using a spectrometer.
4. Determination of wavelength of the laser source.
5. Determination of particle size of lycopodium powder using diode laser.
6. Determination of acceptance angle and numerical aperture of an optical fibre using diode laser
7. Determination of coefficient of viscosity of liquid by Poiseuille's method.
8. Determination of specific resistance of a given wire using Carey Foster's bridge.
9. Determination of the thermal conductivity of a bad conductor using Lee's Disc apparatus.
10. Determination of band gap of the given semiconductor diode.
11. V-I Characteristics of PN junction diode
12. V-I Characteristics of Zener diode
13. Performance analysis of half wave rectifier.
14. Performance analysis of bridge rectifier.

TOTAL: 45 Hours

U19EE203 - ELECTRIC CIRCUITS AND ELECTRON DEVICES LABORATORY

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the course, the students will be able to

1. calculate electrical parameters of DC circuits using basic circuital laws and to determine the loop currents and nodal voltages of DC circuits.
2. apply various circuit theorems to solve complex DC networks.
3. analyze the performance characteristics of switching devices, converter circuits, relaxation oscillator and controlled rectifier.

List of Experiments

1. Verification of Ohm's Law and Kirchhoff's Laws
2. Calculation of Mesh currents and Node voltages
3. Verification of Superposition Theorem
4. Verification of Thevenin's and Norton's Theorems
5. Verification of Maximum Power Transfer Theorem
6. Analysis of RLC series and parallel circuits
7. Measurement of power and power factor by two wattmeter method
8. Analysis of I/O characteristics of BJT with CE configuration
9. Performance analysis of relaxation oscillator
10. Performance analysis of JFET and MOSFET
11. Performance analysis of DIAC and TRIAC
12. Analysis of single phase controlled rectifier

TOTAL : 45 Hours

U19GE201 - BASIC APTITUDE - II

L	T	P	C
0	0	2	0

Course Outcomes: At the end of the course, the students will be able to

CO1: solve more elaborate problems than those in BA-I in specific areas of quantitative aptitude.

CO2: solve problems of greater intricacy than those in BA-I in stated areas of logical reasoning.

CO3: demonstrate higher than BA-I level verbal aptitude skills in English with regard to specific topics.

List of Experiments

1. QUANTITATIVE APTITUDE AND LOGICAL REASONING

Solving quantitative aptitude and logical reasoning problems with reference to the following topics:

a. Ratio and proportion
b. Partnership
c. Chain rule
d. Ages
e. Profit, loss and discount
f. Geometry
g. Area and volume
h. Data arrangement

2. VERBAL APTITUDE

Demonstrating verbal aptitude skills in English with reference to the following topics:

a. Jumbled sentences
b. Reconstructions of sentences (PQRS)
c. Sentence fillers two words
d. Idioms and phrases
e. Spotting errors
f. Writing captions for given pictures

TOTAL : 24 Hours

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester III under Regulations 2019
Branch: Electrical and Electronics Engineering

S. No.	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U19EE301	Network Analysis and Synthesis	3	1	0	4
2	U19EE302	Analog Electronics	3	0	0	3
3	U19EE303	Electromagnetic Fields	3	1	0	4
4	U19EE304	Electrical Machines – I	3	0	0	3
5	U19EE305	Applied Thermodynamics	3	0	0	3
6	U19CS309	Object Oriented Programming in C++	3	0	0	3
7	U19GE302	**Mandatory Course:** Environment and Climate Science	2	0	0	0
Practical						
8	U19EE306	Analog Electronics Laboratory	0	0	2	1
9	U19EE307	Electrical Machines Laboratory – I	0	0	2	1
10	U19CS310	Object Oriented Programming in C++ Laboratory	0	0	2	1
11	U19GE301	Soft Skills and Aptitude – I	0	0	2	1
					Total Credits	**24**

Approved By

Chairperson, Electrical and Electronics Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.S.Padma	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Electrical and Electronics Engineering, Third Semester BE EEE Students and Staff, COE

U19EE301 NETWORK ANALYSIS AND SYNTHESIS 3 1 0 4

COURSE OUTCOMES:

At the end of this course the student will be able to,

- Analyse the transient response of circuits.
- Define various network topologies and analyse circuits.
- Solve and analyse one port and two port networks.
- Analyse coupled circuits and design of filters.
- Synthesize RL, RC and LC networks

UNIT I CIRCUIT TRANSIENT ANALYSIS 12

Introduction – transient response of RL & RC for step input and sinusoidal input – transient response of RLC series circuit for step input using Laplace transform method – problems.

UNIT II NETWORK TOPOLOGY 12

Introduction – graph of a network – definitions associated with graph – incidence matrix –loop matrix – cut set matrix – KVL – KCL – network equilibrium equations – applications to network solutions.

UNIT III ONE PORT AND TWO PORT NETWORKS 12

One port network – driving point impedance and admittance – two port network – Z parameters – Y parameters – ABCD parameters – h parameters – inter relationship between parameters – interconnection of two port networks – equivalent networks (T & π networks) – problems.

UNIT IV COUPLED CIRCUITS AND FILTERS 12

Coupled circuits: Inductive coupling in series and parallel circuits – tuned circuits – single and double tuned coupled circuits – problems.

Filters: Types - Characteristics of ideal filters – low pass and high pass filters – attenuation and phase shift constants – design of constant-k and m-derived filters – problems.

UNIT V ELEMENTS OF NETWORK SYNTHESIS 12

Introduction – Hurwitz polynomials – properties of Hurwitz polynomials – PR functions –necessary and sufficient conditions of PR function – synthesis of RL, RC and LC functions – problems.

Lecture: 45, Tutorial: 15, Total: 60

TEXT BOOKS:

1. Ravish R Singh, "Electrical Networks", McGraw Hill, 2011.
2. Shyam Mohan S.P., Sudhakar A, "Circuits and Network Analysis & Synthesis", Tata McGraw Hill, 5th edition, 2015.

REFERENCES BOOKS

1. Chakrabarti A, "Circuits Theory (Analysis and Synthesis)", Dhanpath Rai & Sons, 2013.
2. Arumugam M and Premkumar N, "Electric Circuit Theory", Khanna & Publishers, 2006.
3. Soni M.L and Gupta J.C, "Electrical circuit Analysis", Dhanpat Rai and Sons, Delhi, 1990.
4. Kuo F.F., "Network Analysis and Synthesis", Wiley International Edition, Second Edition, 1996.

U19EE302 ANALOG ELECTRONICS 3 0 0 3

COURSE OUTCOMES

At the end of this course the student will be able to,

- Analyze the small signal model for the configurations of transistor and FET.
- Discuss and analyze the various types of large signal and feedback amplifiers.
- Design various types of multistage amplifiers and oscillators.
- Infer the DC and AC characteristics of op-amp and its effect on output and their compensation techniques.
- Elucidate and design circuits for various applications of op-amp.

UNIT I TRANSISTOR ANALYSIS 9

Transistor as an amplifier- h–parameters – forward Ai, Zi, reverse Av and Yo – BJT h-model – Analysis of h-parameters for CE, CB, CC configurations – RF amplifier – Bias stability – dc load line, ac load line, operating point, stability factor, thermal runaway – Methods of transistor biasing – Bias compensation – Small signal analysis of CS amplifier.

UNIT II LARGE SIGNAL AND FEEDBACK AMPIFIERS 9

Differential amplifier – Common mode and Difference mode analysis - analysis of Class A,B,C and AB Power amplifiers –- Feedback Amplifiers - Concept of feedback, General characteristics of negative feedback amplifiers - Effect of feedback on I/O resistance- types of negative feedback amplifiers – stability of feedback amplifier.

UNIT III MULTISTAGE AMPLIFIERS AND OSCILLATORS 9

Introduction – different coupling schemes in amplifiers – operation, advantages and disadvantages of RC coupled, transformer coupled, cascade, direct coupled and darlington amplifiers - Condition for Oscillations - RC phase shift Oscillators with transistor and FET- Hartley and Colpitts Oscillators - Wein-Bridge Oscillator - Crystal Oscillator- Frequency and Amplitude Stability Oscillators.

UNIT IV CHARACTERISTICS OF OP-AMP 9

Block diagram of operational amplifier, packing characteristics, ideal op-amp – ideal operational amplifier – differential mode, common mode, CMRR – ideal op-amp characteristics – practical op-amp characteristics – open loop and closed loop configuration of ideal and practical op-amp as an inverting amplifier, non-inverting amplifier, voltage follower, DC characteristics, AC characteristics – frequency response, slew rate, frequency compensation.

UNIT V APPLICATIONS OF OP-AMP 9

summing amplifier – adder, subtractor, low pass and high pass filters, three op-amp instrumentation amplifier, log and antilog amplifiers, waveform generator (triangular, saw tooth and stair case waveforms), sample and hold circuit, differentiator, integrator, comparators & its characteristics, Schmitt trigger, peak detector, precision rectifiers.

Lecture: 45, Tutorial: 0, TOTAL: 45 Hours

TEXT BOOKS

1. S Salivahanan, N Sureshkumar and A Vallavaraj, “Electronic Devices and Circuits”, Tata Mcgraw Hill, 6th reprint 2015.
2. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 4th Edition ,2012.

REFERENCE BOOKS

1. David A Bell, “Electronic Devices and Circuits”, Oxford University Press, Fifth edition, 2010.
2. Ramakant A.Gayakwad, “Op-amp and Linear ICs”, Prentice Hall, 4th Edition, 2010.
3. J Millman, CC Halkias and SathyabrathaJit , “Electronic Devices and Circuits”, Tata Mcgraw Hill, 2nd Ed, 2012.
4. Robert F. Coughlin, Frederick F. Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, PHI, 2015.

U19EE303 ELECTROMAGNETIC FIELDS 3 1 0 4

COURSE OUTCOMES

At the end of this course the student will be able to,

- Describe the Electromagnetic quantities in spatial distribution of different coordinate systems.
- Describe the behavior of Electric field intensity and Electric flux density due to various charge distributions.
- Apply the principles of magnetostatics to magnetic field, boundary condition and inductance.
- Understand the concepts related to faraday's law, induced emf and Maxwell's equation.
- Illustrate the concepts of electromagnetic wave equation, wave propagation and Poynting theorem.

UNIT I VECTOR CALCULAS 12

Scalar and vector fields - Coordinate systems; cartesian, cylindrical and spherical coordinate systems - relationship between coordinate systems - types of integral related to EMF - Gradient - Curl - Divergence theorem – Stoke's theorem – simple problems.

UNIT II ELECTROSTATICS 12

Coulombs' law - Electric field intensity, electric flux density and electric potential due to various charge distributions - Electric field intensity due to infinite line charge, charged circular ring, infinite sheet of charge - Gauss's law and applications - Electric dipole - Boundary conditions - Poisson's and Laplace's equations - Capacitance; capacitance of parallel conductors, capacitance of an isolated sphere, concentric spheres and coaxial cables – simple problems.

UNIT III MAGNETOSTATICS 12

Lorentz law of force - Biot-savart law - Ampere's circuital law - Magnetic field intensity and magnetic flux density - B and H due to finite length of conductor, at any point along the axis of circular coil, at any point along the axis of solenoid, at the centre of toroidal coil - Magnetic dipole - Magnetization - Boundary conditions at the magnetic surface - Magnetic torque - Inductance; self and mutual inductance, inductance of solenoid and toroid, coaxial cable, two transmission lines – simple problems.

UNIT IV ELECTRODYNAMIC FIELDS 12

Faraday's law of electromagnetic induction - Coefficient of coupling - Point form of Gauss's law - Maxwell's equation (differential and integral form) - Conduction current - Displacement current – Current densities - Equation of continuity - Energy stored in electric and magnetic fields; energy density - Relation between field theory and circuit theory – simple problems.

UNIT V ELECTROMAGNETIC WAVES 12

Derivation of Electromagnetic wave equations - Wave equations for free space - Wave parameters; velocity, intrinsic impedance - Wave propagation in a lossless medium, wave propagation in a conducting medium, wave propagation in good dielectrics and good conductors - Skin effect - Poynting theorem – simple problems.

Lecture: 45, Tutorial: 15, Total: 60 Hrs.

TEXTBOOKS

1. Matthew N.O. Sadiku, "Principles of Electromagnetics", 5th Edition, International Version, Oxford University Press 2015.
2. W.H.HaytJ.A.Buck and M.Jallel Akhtar, "Engineering Electromagnetics", 8th Edition, McGraw Hill Education (India) Private Limited, Special Indian Edition 2014.

REFERENCEBOOKS

1. K A Gangadhar, 'Electromagnetic Field Theory', Khanna Publishers; Eighth Reprint :2015.
2. Kraus/Fleisch, "Electromagnetics with Applications", 5th Edition, McGraw Hill Education (India) Edition 2010.
3. S C Mahapatra, SudiptaMahapatra, "Principles of Electromagnetics", Mc Graw Hill Education (India) Private Limited, New Delhi,2nd Edition 2015.
4. S.P.Ghosh, LipikaDatta, 'Electromagnetic Field Theory', First Edition, McGraw HillEducation (India) Private Limited, second reprint 2015.

U19EE304 ELECTRICAL MACHINES – I 3 0 0 3

COURSE OUTCOMES:

At the end of the course student should be able to,

- Explain the fundamentals of energy conversion and single-phase transformer.
- Classify different types of polyphase connections of transformer and find the efficiency of transformer.
- Explain the constructional details and principle of operation of DC generator and analyse its performance.
- Explain the constructional details and principle of operation of DC motor and analyse its performance.
- Calculate the efficiency of DC machines using direct and indirect testing.

UNIT I MAGNETIC CIRCUITS AND SINGLE PHASE TRANSFORMER 9

Principles of Electromechanical energy conversion –. Single Phase Transformer – principle of operation – construction – classification of transformers –EMF equation – transformation ratio – transformer on no-load and load – phasor diagrams – equivalent circuit – voltage regulation – auto transformer – applications – simple problems.

UNIT II THREE PHASE TRANSFORMER AND TESTING 9

Three-phase transformers – principle – construction – three phase transformer connections – star, zig-zag, open-delta, Scott connection– three-phase to single-phase conversion – parallel operation – testing of transformers – polarity test, load test – phasing out test – Sumpner's test – condition for maximum efficiency, all day efficiency - applications – simple problems.

UNIT III DC GENERATORS 9

Principle of operation, constructional details, armature windings, EMF equation- voltage build up process-methods of excitation – separate, shunt, series and compound excitations – no-load and load characteristics – armature reaction – commutation –inter poles, compensating windings – applications – simple problems.

UNIT IV DC MOTORS 9

Principle of operation –types of motors - torque equation – electrical and mechanical characteristics of DC shunt, series and compound motors – power flow – starting and braking of DC Shunt motors – starting and braking of DC Series motors - introduction to soft starter - speed control – applications – simple problems.

UNIT V TESTING OF DC MACHINES 9

Losses and efficiency in DC machines – condition for maximum efficiency – testing of DC machines – brake test, Swinburne's test and Hopkinson's test – Field's test - separation of losses – simple problems.

Lecture: 45 Hours; Tutorial: 0 Hours; Total: 45 Hours

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, "Electric Machines", McGraw Hill Publishing Company Ltd, Fourth Edition, 2014.
2. B.L. Theraja and A.K. Theraja, "A Text Book of Electrical Technology", S.Chand Publisher, Vol 2, 2014.

REFERENCE BOOKS

1. Samarajit Ghosh, “Electrical Machines”, Pearson Education, second edition, 2012.
2. Stephen J Chapman, “Electric Machinery Fundamentals”, Tata McGraw-Hill Education Private Ltd, Fifth Edition, 2012.
3. M.Ramamoorthy, O. Chandra Sekhar, “Electrical Machines”, PHI Learning Pvt.Ltd., 2018.
4. S.K.Sahdev, “ Electrical Machines”, Cambridge University Press,2018.

U19EE305 APPLIED THERMODYNAMICS 3 0 0 3

COURSE OUTCOMES

At the end of each unit, the students will be able to -

- Discuss the thermodynamic properties of system and apply zeroth and First Law of Thermodynamics to solve engineering problems.
- Determine the thermal efficiency of steam power plant and discuss the various components of thermal power plant
- Explain the types of Refrigeration system and calculate the cooling, heating and humidifier capacities for various air-conditioning components by using psychrometric charts.
- Analyze the performances of hydraulic turbines.
- Evaluate the performance of centrifugal pumps and identify the various types of pumps and compressor for specific application.

UNIT I FUNDAMENTALS OF THERMODYNAMICS 9

Introduction to Thermodynamics – Concept of a System – Types of Systems – Thermodynamic Equilibrium – Properties - State - Process and Cycle – Zeroth Law – Energy Interactions – Heat and Work – Types of Work – First Law: Cycle and Process – Heat and work Interactions in a Closed System for Various Processes – Limitations of First Law - Non-flow and flow processes.

UNIT II STEAM POWER PLANT AND ITS COMPONENTS 9

Thermal Power Plant Layout – Four Circuits – Rankine Cycle – Steam properties- quality of steam - simple problems. Boilers: -Classification- Fire Tube vs Water Tube boilers-Babcock & Wilcox – Cochran Boilers. Steam Turbines: Impulse and. Reaction Turbines –Condensers: Types – Jet & Surface Condensers. Cooling Towers - Dust collector – Draught system.

UNIT III REFRIGERATION SYSTEM AND AIR CONDITIONING 9

Refrigeration – ton of refrigeration - Vapour compression refrigeration system - cycle, p-h chart, Vapour absorption system- comparison- properties of refrigerants.

Air conditioning - types of Air conditioning system and working principles- - Study on psychrometric charts, psychrometric processes - Properties of Air (DBT, %RH, WB, DPT, and enthalpy) - simple Problems.

UNIT IV HYDRAULIC TURBINES 9

Hydraulic turbines - classification and working principle.Pelton wheel turbine - Francis turbine -Kaplan turbine - Velocity triangle - work done – Efficiencies - Performance calculations.

UNIT V PUMPS & COMPRESSOR 9

Centrifugal pumps– working principle - Velocity triangle - work done- Efficiencies- Performance calculations. Reciprocating pump- working principle – Comparison

Compressor - Classification- Applications - Reciprocating compressor and Rotary Compressor– working principle – Comparison.

Lecture: 45 Hours; Tutorial: 0 Hours; Total: 45 Hours

TEXT BOOKS

1. R.K.Rajput, "Thermal Engineering" ,Laxmi Publications, New Delhi, Sixth edition, 2005.
2. Bansal, R.K., Fluid Mechanics and Hydraulics Machines, (9th edition), Laxmi publications (P) Ltd,New Delhi, 2017.

REFERENCE BOOKS

1. Sarkar B.K., “Thermal Engineering”, Tata McGraw-Hill, New Delhi New Delhi, 2001
2. Arora C.P., “Refrigeration and Air conditioning”, Tata McGraw-Hill, New Delhi, 2000.
3. Rudramoorthy R, “Thermal Engineering”, Tata McGraw Hill Book Company, New Delhi, 2003
4. P. L. Ballaney, “Thermal Engineering: Engineering Thermodynamics and Energy Conversion Techniques”, Khanna Publishers, 5th Edition, 2010.

U19CS309 OBJECT ORIENTED PROGRAMMING IN C++ 3 0 0 3

COURSE OUTCOMES

At the end of the course, the student will be able to

- Explain fundamental programming concepts such as variables, conditional statements, looping constructs.
- Apply derived data types and methods (procedures), inline function, friend function in applications.
- Describe how the class mechanism supports encapsulation and information hiding.
- Apply operator overloading and inheritance in solving real time problems.
- Write C++ programs for applications using files and exceptions.

UNIT I INTRODUCTION TO OOPS AND C++ 9

Introduction to Object Oriented Programming and C++: Object oriented concepts and its characteristics - History of C++ - Applications of C++ - Structure of C++ - Tokens – Keywords – Identifiers - Basic data types - Input and output statements - C++ Operators and control statements.

UNIT II DERIVED DATA TYPES AND FUNCTIONS 9

Derived data types: Arrays – Structures - Unions - Type casting - Symbolic constants - Scope resolution operator -Functions: Function Prototyping - Function components - Passing parameters – Call by value - Call by reference - Inline function - Default arguments - Overloaded function- Introduction to friend function.

UNIT III CLASSES AND OBJECTS 9

Classes and Objects: Class specification - Member function definition - Access qualifiers - Instance creation - Static data members and member functions - Array of objects - Objects as arguments - Returning objects – Constructors - Parameterized Constructors - Overloaded Constructors - Constructors with default arguments - Copy constructors – Destructors.

UNIT IV OPERATOR OVERLOADING AND INHERITANCE 9

Operator Overloading - Operator function – Overloading unary and binary operator – Inheritance Introduction – Types of Inheritance - Constructors in derived class - Abstract classes - Runtime Polymorphism– Array of pointers to base class – Virtual functions - Pure virtual functions – Virtual Destructors.

UNIT V STREAMS AND EXCEPTION HANDLING 9

Streams: Streams in C++ - Stream classes - Formatted and unformatted data – Manipulators - File streams - File pointer and manipulation - File open and close - Sequential and random access - Name Space.

Exception Handling: Principle of exception handling - Exception handling mechanism - Multiple catch statements - Nested try statements.

Total: 45 hours

TEXT BOOK

1. Robert Lafore, “Object-Oriented Programming in C++” Pearson Education, 4 Edition, 2008.
2. K R Venugopal, RajkumarBuyya “Mastering C++” Tata McGraw Hill, New Delhi, Second edition 2015.

REFERENCES

1. H. M. Deitel, P. J. Deitel, " C++ How to Program", Fifth Edition, Deitel& Associates, Inc.
2. Nicholas A. Solter, Scott J. Kleper, "Professional C++", 3rd Edition, Wiley Publishing,
3. Ira Pohl, "Object Oriented Programming using C++", Pearson Education, Second Edition Reprint 2004.
4. S. B. Lippman, Josee Lajoie, Barbara E. Moo, "C++ Primer", Fourth Edition, Pearson Education, 2005.
5. B. Stroustrup, "The C++ Programming language", 3rd edition, Pearson Education, 2004.
6. E. Balaguruswamy, "Object-Oriented Programming with C++" Tata McGraw Hill, New Delhi, Sixth edition 2015.

1. B. Stroustrup, "The C++ Programming language", 3rd edition, Pearson Education, 2004.
2. E. Balaguruswamy, "Object-Oriented Programming with C++" Tata McGraw Hill, New Delhi, Sixth edition 2015.

U19EE306 ANALOG ELECTRONICS LABORATORY 0 0 2 1

COURSE OUTCOMES:

At the end of the course student should be able to,

- Design different amplifier circuits and verify their output waveforms.
- Verify the output waveforms of various types of oscillators.
- Construct circuits for various applications using op-amp and verify their output waveforms.

LIST OF EXPERIMENTS

1. Design the differential Amplifier
2. Verify the output of feedback Amplifier
3. Verify the output waveforms of Hartley and Colpitts Oscillator
4. Verify the output waveforms of Phase shift and Wein-bridge Oscillator.
5. Design of inverting and non-inverting amplifiers.
6. Design of instrumentation amplifier using op-amp.
7. Design of integrator and differentiator (IC741).
8. Designs of Schmitt trigger using op-amp.
9. Design of precision rectifiers using op-amp.
10. Design of adder and subtractor.
11. Design of clipper and clamper circuits using op-amp.

Total: 30 Hours

U19EE307 ELECTRICAL MACHINES LABORATORY – I 0 0 2 1

COURSE OUTCOMES:

At the end of the course student should be able to,

- Analyse the characteristics and determine the efficiency of DC machines.
- Pre-determine the losses on no-load and determine the efficiency and regulation of transformer.
- Control the speed of shunt motor to above and below rated speed using rheostat.

List of Experiments

1. Analyse the open circuit and load characteristics of separately excited DC shunt generator.
2. Analyse the load characteristics of DC compound generator.
3. Analyse the load characteristics of DC shunt motor.
4. Analyse the load characteristics of DC series motor.
5. Analyse the load characteristics of DC compound motor.
6. Speed control on a DC shunt motor by field and armature control method.
7. Analyse the characteristics of DC motor by Swinburne's test and Hopkinson's test on DC motor-generator set.
8. Analyse the load characteristic of single-phase transformer.
9. Predetermine the efficiency of transformer by Sumpner's test and open circuit and short circuit tests.
10. Analyse the no-load losses in single-phase transformer by separation method.
11. Determine the efficiency of Scott connected transformer using load test.

Total: 30 Hours

U19CS310 OBJECT ORIENTED PROGRAMMING IN C++ LAB 0 0 2 1

COURSE OUTCOMES

At the end of the course student should be able to,

- Apply the control structures and functions in C++ to solve problems.
- Develop applications using object oriented concepts.
- Demonstrate the concept of file and exception handling mechanism.

LIST OF EXPERIMENTS

1. Simple C++ programs to implement various control structures
    a. if statement
    b. switch case statement and do while loop
    c. for loop
    d. while loop
2. Programs to implement single and multi-dimensional arrays.
3. Programs to implement Structures.
4. Programs to understand Functions
    a. Built-in and user defined functions
    b. Functions with default arguments
    c. Inline functions
    d. Overloaded Functions
5. Programs to understand different function call mechanism.
    a. call by reference
    b. call by value
6. Programs to understand friend function & friend class.
    a. friend function
    b. friend class
7. Programs to understand constructors, destructors and this pointer.
8. Programs to overload unary & binary operators as member function & non-member function.
    a. unary operator as member function
    b. binary operator as non-member function
9. Programs to implement inheritance and it types.
10. Programs to implement run-time polymorphism.
11. Programs to demonstrate file manipulation.
12. Programs to apply exception handling.

TOTAL: 30 Hours

Semester-III	U19 GE301- SOFT SKILLS AND APTITUDE – I	L T P C Marks 0 0 2 1 100

Course Outcomes

At the end of the course the student will be able to:

1. Demonstrate capabilities in specific soft-skill areas using hands-on and/or case-study approaches
2. Solve problems of greater intricacy in stated areas of quantitative aptitude and logical reasoning
3. Demonstrate higher levels of verbal aptitude skills in English with regard to specific topics

1.Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics:** a. Attitude building b. Dealing with criticism c. Innovation and creativity d. Problem solving and decision making **e.** Public speaking **f.** Group discussions
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. **Vedic Maths:** Fast arithmetic, multiplications technique, Criss cross, Base technique, Square root, Cube root, Surds, Indices, Simplification. b. **Numbers:** Types, Power cycle, Divisibility, Prime factors & multiples, HCF & LCM, Remainder theorem, Unit digit, highest power. c. **Averages:** Basics of averages and weighted average. d. **Percentages**: Basics of percentage and Successive percentages. e. **Ratio and proportion:** Basics of R &P, Alligations, Mixture and Partnership. f. **Profit ,Loss and Discount**: Basic & Advanced PLD g. **Data Interpretation**: Tables, Bar diagram, Venn diagram, Line graphs, Pie charts, Caselets, Mixed varieties, Network diagram and other forms of data interpretation. h. **Syllogism:** Six set syllogism using Venn diagram and tick and cross method
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Verbal analogy b. Tenses c. Prepositions d. Reading comprehension e. Choosing correct / incorrect sentences f. Describing pictures g. Error spotting

Department of Placement Training
Sona College of Technology.
Salem-636 005.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV under Regulations 2019
Branch: Electrical and Electronics Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	U19MAT401B	Probability and Statistical Methods	3	1	0	4
2	U19EE401	Signals and Systems	2	1	0	3
3	U19EE402	Electrical Machines – II	3	0	0	3
4	U19EE403	Power Electronics and Drives	3	0	0	3
5	U19EE404	Digital Electronics and Microcontroller	3	0	0	3
6	U19CS408	Data Structures	3	0	2	4
7	U19GE403	**Mandatory Course:** Essence of Indian Traditional Knowledge	2	0	0	0
Practical						
8	U19EE405	Electrical Machines Laboratory – II	0	0	2	1
9	U19EE406	Power Electronics and Drives Laboratory	0	0	2	1
10	U19EE407	Digital Electronics and Microcontroller Laboratory	0	0	3	1.5
11	U19GE401	Soft Skills and Aptitude - II	0	0	2	1
					Total Credits	**24.5**

Approved By

Chairperson, Electrical and Electronics Engineering BoS
Dr.S.Padma

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electrical and Electronics Engineering, Fourth Semester BE EEE Students and Staff, COE

U19MAT401B PROBABILITY AND STATISTICAL METHODS 3 1 0 4

COURSE OUTCOMES

At the end of the course, the students will be able to

1. apply the concepts of measures of central tendency, dispersion, correlation to the given data and analyze the results.
2. apply the concepts of random variables and their properties to generate the moments.
3. fit the suitable distribution and its properties to the real world problems and interpret the results.
4. apply the concepts of joint probability distribution and its properties to find the covariance.
5. test the hypothesis of the population using sample information.

UNIT – I BASIC STATISTICS 12

Measures of central tendency (simple arithmetic mean, median, mode) – quartile's – measures of dispersion (range, inter-quartile range, quartile deviation, mean deviation, standard deviation, coefficient of variation) – simple correlation – curve fitting (straight line and parabola).

UNIT – II RANDOM VARIABLES 12

Discrete and continuous random variables – probability mass function, probability density function, moments, moment generating function and their properties.

UNIT – III THEORETICAL DISTRIBUTIONS 12

Binomial, Poisson, geometric, uniform, exponential and normal distributions and their properties – applications.

UNIT – IV TWO DIMENSIONAL RANDOM VARIABLES 12

Joint distributions, marginal and conditional distributions – covariance – correlation – central limit theorem.

UNIT – V TESTING OF HYPOTHESIS 12

Sampling distributions – testing of hypothesis for proportion, mean, standard deviation and differences using normal distribution– t-test for single mean and difference between means - χ^2- tests for independence of attributes and goodness of fit and F-test for equality of two variances.

Theory: **45 Hours** Tutorial: **15 Hours** Total**: 60 Hours**

TEXT BOOKS:

1. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11th Edition, Reprint, 2019.
2. T. Veerarajan, "Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks", McGraw Hill Publishers, 4th Edition, 7th Reprint, 2018.

REFERENCE BOOKS:

1. R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.
2. S. Ross, "A First Course in Probability", Pearson Publishers, 9th Edition, 2019.
3. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall Publishers, Reprint, 2003.
4. W. Feller, "An Introduction to Probability Theory and Its Applications – Volume – I", Wiley Publishers, 3rd Edition, 2008.

U19EE401 SIGNALS AND SYSTEMS 2 1 0 3

COURSE OUTCOMES:

At the end of the course student should be able to,

- Explain the basic properties of signal & systems and the various methods of classification.
- Apply Laplace transform & Fourier transform for continuous signals and systems analysis.
- Analyse discrete time signals and linear time invariant systems.
- Analyse LTI systems in the time domain and various transform domains.
- Analyse discrete transforms properties

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous Time signals (CT signals) – Discrete Time signals (DT signals) – step, ramp, pulse, impulse, sinusoidal, exponential, classification of CT and DT signals –periodic & aperiodic signals, deterministic & random signals, energy & power signals – CT systems and DT systems classification of systems – static & dynamic, linear & nonlinear, time-variant & time-invariant, causal & non-causal, stable & unstable systems.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS AND LINEAR TIME INVARIENT (LTIV) SYSTEMS 9

Fourier and Laplace transforms in CT Signal analysis – Fourier and Laplace transforms in analysis of CT systems – Dirichlet's Conditions - Properties of Fourier and Laplace Transform s - Initial Value, Final Value and Parseval's Theorems.

UNIT III ANALYSIS OF DISCRETE TIME SIGNALS 9

Baseband sampling – Sampling Theorem for Low pass Signals - under sampling - Nyquist Rate and Nyquist Interval - Discrete Time Fourier Transform (DTFT) – properties of DTFT – Z transform – properties of Z transform.

UNIT IV LINEAR TIME INVARIANT DISCRETE TIME SYSTEMS 9

Difference equations – Block diagram representation - Direct form I and Direct Form II structures – impulse response – convolution sum – discrete Fourier and Z transform analysis – Magnitude / Phase Transfer Function using Fourier Transform – Pole-Zero Plots.

UNIT V DISCRETE TRANSFORMS 9

Discrete Fourier Transform(DFT) – definition – properties, computation of Discrete Fourier Transform(DFT) using Fast Fourier Transform(FFT) algorithm – Decimation in Time (DIT) domain and Decimation in Frequency(DIF) domain – Fast Fourier Transform(FFT) using radix-2 – Butterfly structure – computation of Inverse Discrete Fourier Transform(IDFT) using DFT- Architecture of TMS320C54X Processor.

Lecture: 30; Tutorial:15; Total: 45 Hours

TEXT BOOKS:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson Education, 2007.
2. Edward W Kamen& Bonnie's Heck, "Fundamentals of Signals and Systems",Pearson Education, 2007.

REFERENCES:

1. H.P.Hsu, RakeshRanjan, "Signals and Systems", Schaum's Outlines, Tata McGraw Hill, Indian Reprint, 2007
2. S.Salivahanan, A.Vallavaraj, C.Gnanapriya, "Digital Signal Processing", McGraw Hill International, 2007.
3. Simon Haykins and Barry Van Veen, "Signals and Systems", John Wiley & sons Inc., 2004.
4. Rodger E.Ziemer, William H.Tranter, D.RonaldFannin,"Signals &Systems", Pearson Education, Fourth Edition, 2002.

U19EE402 ELECTRICAL MACHINES-II 3 0 0 3

COURSE OUTCOMES

At the end of the course student should be able to,

1. Illustrate the construction and working of alternators and apply various methods to calculate voltage regulation.
2. Explain the operation and derive the power equations of synchronous motor.
3. Explain the construction and operation of three phase induction motor.
4. Calculate the performance characteristics of induction motor using circle diagram and explain various starting methods and speed control methods of three phase induction motor.
5. Construct the equivalent circuit of single phase induction motor and explain the fundamentals of special machines.

UNIT I ALTERNATOR 9

Constructional details – types of rotors – armature windings – terminologies – EMF equation –alternator on load, synchronous reactance – voltage regulation – EMF, MMF and ZPF methods –synchronizing of alternators – synchronizing current and power – change of excitation and mechanical input – Blondel's theory – determination of X_d and X_q using slip test.

UNIT II SYNCHRONOUSMOTOR 9

Principle of operation – starting methods – power flow – effect of change of excitation and load –expression for back EMF – power equations – power/power angle relations – construction of V-curves – hunting – synchronous condenser – Applications.

UNIT III THREEPHASE INDUCTION MOTOR 9

Constructional details – principle of operation – slip and its importance – torque equations – slip-torque characteristics – power and efficiency – equivalent circuit – crawling and cogging – induction generator.

UNIT IV CIRCLE DIAGRAM, STARTERSAND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 9

Load test – no load and blocked rotor test – circle diagram–need for starters – types of starters : stator resistance and reactance, rotor resistance, auto-transformer and star-delta starters – speed control – voltage, voltage/frequency, poles and rotor resistance – cascaded connection.

UNIT V SINGLE-PHASE INDUCTION MOTOR AND SPECIALMACHINES 9

Principle of operation – double revolving field theory – types of single phase induction motor – equivalent circuit – performance calculation – no load and blocked rotor test – Basics of BLDC Motor, stepper motor and Universal motor – applications.

Lecture: 45, Tutorial: 00, Total: 45 Hours

TEXT BOOKS:

1. B.L.Theraja and A.K.Theraja, "A Text Book of Electrical Technology", S.Chand Publisher, Fifth Edition, 2008.
2. D.P.Kothari and I.J.Nagrath, "Electric Machines", Tata McGraw Hill Publishing Company Ltd, Fourth Edition, 2011.

REFERENCES:

1. A.E.Fitzgerald, Charles Kingsley, Stephen.D.Umans, "Electric Machinery", Tata McGraw Hill Publishing Company Ltd, 2013.
2. K.Murugesh Kumar, "Induction & Synchronous Machines", Vikas Publishing House Pvt. Ltd, 2000.
3. M.V Deshpande, "Electrical Machines", Wheeler Publishing, 2011
4. M. G. Say, "Performance and Design of AC Machines", CBS Publishers, 3rd Edition, 2002.

U19EE403 POWER ELECTRONICS AND DRIVES 3 0 0 3

COURSE OUTCOMES

At the end of this course the students will be able to,

1. Illustrate the operation of single phase and three phase controlled converters and analyze the operation of choppers with relevant mode waveforms.
2. List various types of inverter and explain the operation of single phase and three phase inverters with and outline voltage control and harmonic reduction methods.
3. Explain operation of single phase and three phase AC voltage regulators with its sequence control techniques and summarize the operation of cyclo converters.
4. Describe the steady state operation and transient dynamics of a motor load system.
5. Analyze the operation of the converter fed, inverter fed and chopper fed DC & A C drives.

UNIT I PHASE-CONTROLLED CONVERTERS AND CHOPPERS 9

Single phase converter - half controlled bridge converter and full controlled bridge converter with R Load – analysis of average & RMS values of load voltage, load current and input power factor- Three phase full bridge converter – Half controlled and fully controlled converter with R Load.

DC Choppers: Principle of step up, step down chopper and Chopper operation – Control strategies – Classification & operation of choppers class (A, B, C, D, E)

UNIT II INVERTERS 9

Types of inverters – operation of Single phase and three phase (120^o, 180^o) voltage source inverter modes analysis with star connected R load – operation of single phase current source inverter – series inverters – Voltage control of Single phase inverters – harmonic reduction techniques and filters.

UNIT III AC TO AC CONVERTERS 9

AC Voltage Controllers : Single phase voltage regulators – half wave and full wave with R, RL loads – sequence control of AC regulators – two stage sequence regulator with R, RL load – Multistage sequential control of AC regulators – Introduction to Three phase regulators (no analysis).

Cycloconverters: Single phase to single phase cycloconverter – three phase to single phase and three phase to three phase cycloconverters.

UNIT IV INTRODUCTION TO ELECTRIC DRIVES 9

Electric drives – advantage of electric drives – selection of motor power rating – thermal model of motor for heating and cooling – classes of duty cycle – determination of motor rating four quadrant operations – starting, braking and reversing operations.

UNIT V SOLID STATE CONTROL OF DC & AC DRIVES 9

DC DRIVES: Single-phase and three-phase converter fed drives – continuous and discontinuous conduction modes – chopper fed drives.

AC DRIVES: Induction motor drives – stator control – stator voltage and frequency control –Cyclo-converter fed drives.

Lecture: 45, Tutorial: 0, TOTAL: 45Hours

TEXT BOOKS

1. Singh.M.D. & Khanchandani.K.B. Power Electronics McGraw Education (India) Private limited, New Delhi 2016.
2. Gopal K Dubey, "Fundamentals of Electric Drive", Narosa Publications, II Edition, 2002**.**

REFERENCES

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, PHI Third edition, New Delhi 2004.
2. Ned Mohan Tore. M.Undeland, William.P.Robbins, 'Power Electronics: Converters, applications and Design', John Wiley and sons, third edition, 2003.
3. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition 2003.
4. Bimal K.Bose, "Modern Power Electronics and AC Drives", Prentice Hall of India, 2005.

U19EE404 DIGITAL ELECTRONICS AND MICROCONTROLLER 3 0 0 3

COURSE OUTCOMES

At the end of this course the students will be able to

1. simplify switching functions and understand logic families.
2. design combinational logic circuits using gates and MSI devices.
3. analyse and design sequential logic circuits and counters using Flip-flops.
4. explain the architecture and features of microcontroller and arm processor.
5. write assembly language programs and apply in electrical appliances.

UNIT I BOOLEAN ALGEBRA AND LOGIC FAMILIES 9

Introduction to digital logic and number systems – Binary codes: Gray and BCD – Logic gates – Boolean algebra: Laws, theorems and minimization of switching functions – Simplification using Karnaugh map (upto five variables).

Logic families: terminologies, types, TTL and CMOS gates – comparison.

UNIT II COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS 9

Design of adder, subtractor (half and full), 4-bit binary adder / subtractor and comparator (single bit) – Encoder, Decoder, Demultiplexer and Multiplexer – Realization of combinational circuits using decoders and multiplexers.

Sequential logic: SR latch – Level and edge triggering – Flip-Flops (FF): SR, JK, D and T - conversion between flip flops – Shift registers.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC CIRCUITS 9

Analysis and design of synchronous sequential circuits – Moore and Mealy models – State diagram, state table, state reduction and state assignment.

Design of synchronous and asynchronous counters: Up, down and modulo counters – Sequence detectors.

UNIT IV MICROPROCESSOR AND MICROCONTROLLER 9

Over view of microprocessor: Terminologies, functional block diagram, applications–Introduction to Microcontroller – Microprocessor vs Microcontroller – 8051 Microcontroller: Architecture, memory organization, port operation, counters and timers, serial communication, interrupts – Introduction to ARM Processor: features, simple architecture of ARM 7 processor.

UNIT V 8051 PROGRAMMING AND APPLICATIONS 9

8051 instruction set and addressing modes – simple programming –Temperature sensor interfacing with 8051.

Applications: waveform generation, speed control of stepper motor, DC motor and traffic light control.

Lecture: 45, Tutorial: 0, TOTAL: 45Hours

TEXT BOOKS:

1. Morris Mano M and Michael D. Ciletti, "Digital Design", Pearson Education, 6th edition, 2018.
2. Krishna Kant, "Microprocessors and Microcontrollers", PHI Publisher, 2013.

REFERENCE BOOKS:

1. Anand Kumar A, "Fundamentals of Digital Circuits", PHI Publishers, 4th edition, 2016.
2. Padmanabhan T.R., "Introduction to Microcontrollers and their Applications", Narosa Publishing House, 2012
3. Nagoor Kani A, "Microprocessors and Microcontrollers", McGraw Hill Education, 2020.
4. Senthil Kumar N., Saravanan M. & Jeevananthan S., "Microprocessors and Microcontrollers", Oxford Publication, 2nd edition 2016.

U19CS408 **DATA STRUCTURES** **3 0 2 4**

COURSE OUTCOMES:

At the end of the course, the students will be able to

1. Implement abstract data types for linear data structures
2. Solve real world problems using stack and queue linear data structures
3. Apply various non-linear tree data structures in real time applications
4. Design algorithms to solve common graph problems
5. Analyze various searching, sorting and hashing techniques

UNIT I LINEAR DATA STRUCTURES – LIST 15

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation - Singly linked lists - Circularly linked lists - Doubly-linked lists – Applications of lists

List of Experiments:

- Implementation of Lists

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 15

Stack ADT – Operations– Evaluating arithmetic expressions - Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Double ended queue – Applications of Stacks and queues.

List of Experiments:

- Implementation of Stacks
- Implementation of Queues

UNIT III NON-LINEAR DATA STRUCTURES – TREES 15

Trees – Traversals – Binary Trees – Expression trees – Applications of trees – Binary search trees - AVL Trees – B-Tree – Heap – Applications of heap -Tries.

List of Experiments:

- Implementation of Binary Search Trees
- Implementation of AVL Trees
- Implementation of Heap

UNIT IV NON-LINEAR DATA STRUCTURES – GRAPHS 15

Graphs - Representation of graph – Graph traversals – Breadth-first traversal – Depth-first traversal – Minimum Spanning Trees: Prim's algorithm, Kruskal's algorithm – Shortest path algorithms: Dijkstra's algorithm - Applications of Graphs: Topological Sort.

List of Experiments:

- Implementation of graphs using BFS and DFS.
- Implementation of Prim's algorithm.
- Implementation of Kruskal's algorithm
- Implementation of Dijkstra's algorithm

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 15

Searching - Linear Search – Binary Search, Sorting – Bubble sort– Insertion sort – Merge sort, Hashing - Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

List of Experiments:

- Implementation of Hashing and Collision Resolution Technique
- Implementation of Searching Techniques
- Implementation of Sorting Techniques

Lecture: 45, Practical: 30, TOTAL: 75 Hours

TEXT BOOKS

1. Mark Allen Weiss, "Data structures and Algorithm Analysis in C", Pearson Education, New Delhi, Second Edition, 2012.

REFERENCES

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest , Clifford Stein, "Introduction to Algorithms" ,3rd Edition, MIT Press, 2010.
2. Jean Paul Tremblay and Sorenson, "An Introduction to Data Structures with Applications", McGraw Hill Publishing Company, New Delhi, Second Edition, 2007.
3. Yedidyah Langsam, Moshe J Augenstein and Aaron M Tanenbaum, "Data Structures using C and C++", Prentice Hall of India/ Pearson Education, New Delhi, 2006.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Silicon Press, New Jersey, Second Edition, 2005.

U19EE405 ELECTRICAL MACHINES LABORATORY–II 0 0 2 1

COURSE OUTCOMES:

At the end of the course student should be able to,

1. Determine the regulation of three-phase alternator using EMF, MMF, ZPF, slip test, inductive and capacitive load methods.
2. Analyse the V and inverted V curves of three-phase synchronous motor.
3. Draw the performance characteristics and equivalent circuit of single-phase and three-phase induction motor.

LIST OF EXPERIMENTS:

1. Regulation of three-phase alternator by EMF and MMF methods.
2. Regulation of three-phase alternator by ZPF method.
3. Regulation of three-phase salient pole alternator by slip test.
4. Synchronization and load sharing by two alternators.
5. Plotting V and inverted V curve of three-phase synchronous motor.
6. Comparison of performance quantities of three-phase squirrel cage and slip ring induction motors.
7. Equivalent circuit of a three-phase induction motor.
8. Pre-determination of performance from circle diagram of a three-phase induction motor.
9. Determination of starting current of a three-phase induction motor with different types of starters.
10. Determination of equivalent circuit of single-phase induction motor.
11. Performance analysis of three-phase alternator.
12. Regulation of three-phase alternator using inductive load and capacitive load.
13. Performance calculation of BLDC motor.

Total: 30 Hours

U19EE406 POWER ELECTRONICS AND DRIVES LABORATORY 0 0 2 1

COURSE OUTCOME

At the end of this course the students will be able to,

1. Design various configurations of converters to fed R and RL & RLE loads.
2. Verify the operation of step down and step up choppers, commutated choppers, single phase and three phase PWM inverters, cyclo converter and AC voltage regulators.
3. Simulate AC and DC drives using power electronics modules and the performance characteristics of AC, DC and special drives

LIST OF EXPERIMENTS

1. Design of single phase half controlled & fully controlled converter using R, RL & RLE Loads.
2. Design of three phase half controlled & fully controlled converter using R, RL & RLE Loads
3. Design of step down and step up MOSFET based choppers.
4. Construct and verify the four quadrant operation of chopper.
5. Design IGBT based single-phase PWM inverter.
6. Design IGBT based three-phase PWM inverter(120 and 180 degree)
7. Design of single phase cyclo converter.
8. Construct single phase and three phase AC voltage regulators and verify its operation.
9. Design and Simulation of closed loop control of converter fed DC motor.
10. Design and Simulation of closed loop control of chopper fed DC motor.
11. Design and Simulation of VSI fed 3 phase induction motor.
12. Speed control of 3 phase induction motor using PWM inverter

Total: 30 Hours.

U19EE407 DIGITAL ELECTRONICS AND MICROCONTROLLER LABORATORY 0 0 3 1.5

COURSE OUTCOME

At the end of this course the students will be able to

1. Implement the Boolean functions using logic gates and digital ICs.
2. Design and implement counters and shift registers.
3. Write and implement simple programs using microcontroller.

LIST OF EXPERIMENTS

1. Implementation of Boolean functions using logic gates.
2. Implementation of adder and subtractor circuits using logic gates.
3. Implementation of combinational circuits using Decoder and Multiplexer.
4. Design and implementation of synchronous counters using flip-flop.
5. Design and implementation of asynchronous counters using flip-flop.
6. Design and implementation of shift registers.
7. Simple arithmetic operations using 8051 microcontroller.
8. Simple array operations using 8051 microcontroller.
9. Interfacing and Programming of DC Motor Speed Control
10. Interfacing and Programming of Temperature Indicator
11. Interfacing and Programming of Water tank level control
12. Measurement and data acquisition of temperature using NI CIRO

Total: 45 Hours

Semester – IV	U19GEL401 SOFT SKILLS AND APTITUDE – II	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

At the end of the course the student will be able to:

1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
2. Solve problems of increasing difficulty than those in SSA-I in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
3. Demonstrate greater than SSA-I level of verbal aptitude skills in English with regard to given topics and score 65-70% marks in company-specific internal tests

1.Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics:** a. SWOT b. Goal setting c. Time management d. Stress management e. Interpersonal skills and Intrapersonal skills f. Presentation skills g. Group discussions
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. Equations: Basics of equations , Linear, Quadratic Equations of Higher Degree and Problem on ages. b. Logarithms, Inequalities and Modulus c. Sequence and Series: Arithmetic Progression, Geometric Progression, Harmonic Progression, and Special Series. d. Time and Work: Pipes & Cistern and Work Equivalence. e. Time, Speed and Distance: Average Speed, Relative Speed, Boats & Streams, Races and Circular tracks and Escalators. f. Arithmetic and Critical Reasoning: Arrangement, Sequencing, Scheduling, Network Diagram, Binary Logic, and Logical Connection. h. Binary number System.- Binary to decimal, Octal, Hexadecimal
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Critical reasoning b. Theme detection c. Verbal analogy d. Prepositions e. Articles f. Cloze test g. Company specific aptitude questions

Department of Placement Training

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester V Regulations 2019
Branch: Electrical and Electronics Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19EE501	Generation, Transmission and Distribution Systems	2	1	0	3	45
2	U19EE502	Control Systems	2	1	0	3	45
3	U19EE503	Embedded Systems and IoT	3	0	0	3	45
4	U19EE504	Electrical Machine Design	2	1	0	3	45
5	U19EE505	Total Quality Management in Electrical Industries	3	0	0	3	45
6	noc21-ge23	Solar Energy Engineering and Technology	3	0	0	3	45
Practical							
7	U19EE506	Instrumentation and Control Laboratory	0	0	2	1	30
8	U19EE507	Embedded Systems and IoT Laboratory	0	0	2	1	30
9	U19GE501	Soft Skills and Aptitude – III	0	0	2	1	30
					Total Credits	**21**	

Approved By

Chairperson, Electrical and Electronics Engineering BoS Dr.S.Padma

Member Secretary, Academic Council Dr.R.Shivakumar

Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electrical and Electronics Engineering, Fifth Semester BE EEE Students and Staff, COE

U19EE501 GENERATION, TRANSMISSION AND DISTRIBUTION SYSTEMS 2 1 0 3

COURSE OUTCOMES

At the end of the course student should be able to,

1. Explain the structure of power system and operation of power plants using different sources of electrical energy.
2. Develop expressions for the computation of various transmission line parameters and its application in variousnetworks.
3. Analyse the types of transmission lines by calculating the transmission line efficiency, regulation and sag.
4. Analyse the voltage distribution in insulator strings, its improvement and also the various parameter inunderground cables.
5. Explain the operation of various distribution systems and the principle of operation of various FACTS devices.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2		3	2		2	1	2	1	1	3	2	3	3
CO2	2	3	3	3	2	2	3	3	1		3		3	3
CO3	2	3	3	3	2	2	3	3	1		3		3	3
CO4	2	3	3	3	2	2	3	3	1		3		3	3
CO5	2	1	3	2	1	2	3	3	2	2	3	2	3	3

UNIT I POWER GENERATION AND ECONOMICS 9

Sources of electric energy – structure of electric power system –load characteristics – load curve, load duration curve, important terms and factors – types of loads – selection of generating units – base load and peak load on station (related problems in load characteristics) – economic aspects.

Power plants: construction and working principle of steam, hydroelectric, nuclear, solar and wind power plants.

UNIT II TRANSMISSION LINE PARAMETERS 9

Transmission line conductors – solid, stranded and bundled conductors – parameters of single and three-phase transmission lines – inductance calculation, single phase two-wire, three-phase symmetrical and unsymmetrical space (single and double circuits) – transposition of transmission line conductors – concept of self-GMD and mutual–GMD (single and group of conductors), applications – electric potential – capacitance calculation, single phase two-wire, three-phase symmetrical and unsymmetrical spacing – skin and proximity effects.

UNIT III ANALYSIS OF TRANSMISSION LINES 9

Classification of overhead lines: important terms, calculation of transmission efficiency and voltage regulation of shortline, medium line (end condenser, nominal T, nominal π method) and long line (rigorous method) – equivalent circuits **–** calculation of ABCD constants – Ferranti effect and corona loss – calculation of sag and tension (equal, unequalsupports and effect of wind and ice).

UNIT IV INSULATORS AND CABLES 9

Insulators: properties and types of insulators – Voltage distribution in insulator string – calculation of string efficiency – improvement of string efficiency.

Underground cables: classification of cable – constructional features of LT and HT cables – calculation of capacitance and dielectric stress of a single core cable – grading of cables – thermal resistance of cable. Introduction to Protection for Transmission lines and cable.

UNIT V INTRODUCTION TO MODERN TRANSMISSION SYSTEMS 9

Distribution system: feeders, distributor and service mains – radial, ring-main and interconnected system – AC distribution, primary and secondary distribution – DC distribution 2 wire and 3 wire DC distribution – AC distribution-3 phase 4 wire system and single phase 2 wire distribution-

FACTS: principle of operation of SVC, TCSC, STATCOM, UPFC– merits &demerits of FACTS technology.

Lecture: 30; Tutorial: 15; TOTAL: 45 Hours

TEXT BOOKS:

1. V.K.Mehta and Rohit Mehta, "Principles of Power System", S.Chand Publishers, Reprint Edition, 2006.
2. S.N. Singh, "Electric Power Generation, Transmission and Distribution", Prentice Hall of India Pvt. Ltd, New Delhi, 2008.

REFERENCES:

1. M.L. Soni, Gupta, Bhatnagar, Chakrabarthy, "A Text book on Power Systems Engineering",Dhanpat Rai & Sons,2007.
2. B.R. Gupta, "Generation of Electrical Energy", S.Chand company Ltd., 2009.
3. Wadhwa, C.L., 'Electrical Power Systems', John Wiley and sons Ltd., 2009.
4. G.Ramamurthy, "Handbook of Electrical power Distribution," Universities Press, 2013.

U19EE502 **CONTROL SYSTEMS** **2 1 0 3**

COURSE OUTCOMES:

At the end of the course student should be able to,

1. develop mathematical model of electrical, mechanical systems and derive the transfer functions.
2. perform time-domain analysis of the system to predict the system's behaviour.
3. determine the stability of LTI systems using Routh criterion and root locus technique.
4. analyse the frequency response and stability of LTI systems.
5. obtain state model from transfer function and solve the state equations.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	2	-	-	-	-	-	1	1	3	1
CO2	3	3	2	3	3	-	-	-	-	-	1	2	3	2
CO3	3	3	3	3	3	-	-	-	-	-	1	2	3	2
CO4	3	3	3	3	3	-	-	-	-	-	1	2	3	2
CO5	3	3	3	3	3	-	-	-	-	-	1	3	3	3

UNIT I SYSTEMS AND REPRESENTATION 9

Introduction – classification of control systems – open loop and closed loop systems – transfer functions – Electrical and mechanical (translational and rotational) systems – electrical analogous of mechanical systems – block diagram reduction – Mason's gain formula.

UNIT II TIME DOMAIN ANALYSIS 9

Standard test signals – time response of first order systems – step response of second order systems – time domain specifications – steady state error – static and dynamic error coefficients – Introduction to controllers: P, PD, PI and PID.

UNIT III STABILITY ANALYSIS AND COMPENSATORS 9

Concept of stability – conditions for stability – Routh stability criterion – root locus – effect of addition of poles and zeros – relative stability. Compensation – physical realization of basic compensators (lead, lag and lead-lag).

UNIT IV FREQUENCY DOMAIN ANALYSIS AND STABILITY 9

Frequency response – frequency domain specifications – correlation between time and frequency response – Bode plot – determination of transfer function from log-magnitude plot – polar plot – Nyquist stability criterion.

UNIT V STATE SPACE ANALYSIS OF LINEAR CONTINUOUS-TIME SYSTEM 9

Basic concepts – state model – state space representation using physical variables and phase variables – transfer function from state model – solution of state equations – state transition matrix – controllability and observability – Kalman and Gilbert tests.

Lecture: 30; Tutorial: 15; Total: 45 Hours

TEXTBOOKS:

1. I.J.Nagrath and M.Gopal, “Control Systems Engineering”, VI Edition, New Age International Ltd, Publishers, 2018.
2. F.Golnaraghi, B.C.Kuo, “Automatic Control Systems”, X edition, McGraw Hill education, 2018.

REFERENCES:

1. Katsuhiko Ogata, “Modern Control Engineering”, V edition, Pearson education, 2015.
2. R.C. Dorf and R.H. Bishop, “Modern Control Systems”, XII edition, Pearson education, 2017.
3. J.Distefano, A.Stubberu, et al. “Schaum's Outline: Control Systems”, McGraw Hill, 2017.
4. S. Padma et al., “Control Systems”, Sonaversity, 2015.

U19EE503 EMBEDDED SYSTEMS AND IoT 3 0 0 3

COURSE OUTCOMES

At the end of this course the students will be able to,

1. Explain the architectural features of embedded system.
2. Describe the communication interfaces of embedded systems network and embedded IDE.
3. Define Internet of things and its enabling technologies.
4. Apply the sensors and actuators for suitable applications.
5. Design case studies based on Python Raspberry Pi.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3	2	1	3	2	1	1	1	3	2	3
CO2	2	3	2	3	2	1	3	2	1	1	1	3	2	3
CO3	3	3	2	3	2	1	3	2	1	1	1	3	2	3
CO4	2	3	3	3	2	1	3	2	1	1	1	3	3	3
CO5	3	3	2	3	2	2	3	2	1	1	1	3	3	3

UNIT I INTRODUCTION TO EMBEDDED SYSTEM 9

Introduction to Embedded systems – Processor embedded into a system – Embedded hardware units – Register, memory devices, ports, timer, interrupt controllers – classification of embedded system - Design process in embedded system: design Metrics.

UNIT II BUSES FOR DEVICES NETWORK & EMBEDDED SYSTEM DEVELOPMENT ENVIRONMENT 9

Serial communication using I^2C, SPI, CAN, USB buses - Parallel communication using ISA, PCI, PCI/X buses, arm bus – internet enabled systems-Network protocols.

IDE, Compiler, Linker - Types of File Generated on Cross Compilation-Simulator, Emulator and Debugging.

UNIT III FUNDAMENTALS OF IoT 9

Introduction - Definition and Characteristics of IoT - Physical design - IoT Protocols - Logical design - IoT communication models, IoT Communication APIs - Enabling technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, IoT Levels and Templates - Domain specific IoTs - IoT Architectural view- IOB.

UNIT IV ELEMENTS OF IoT 9

Sensors and actuators – Analog sensors, Digital sensors - examples – Participatory Sensing, Industrial IoT and Automotive IoT – Actuator- Communication modules – Zigbee – LoRa, LoRaWAN – RFID.

UNIT V BUILDING IoT & CASE STUDY 9

IoT platforms – Arduino – Raspberry Pi –Raspberry Pi Interfaces - Real time applications of IoT – Home automation – Automatic lighting – Home intrusion detection – Cities – Smart parking – Environment – Weather monitoring system – Agriculture – Smart irrigation.

Lecture: 45, Tutorial: 00, TOTAL: 45 Hrs

TEXT BOOKS

1. P. Rajkamal, 'Embedded System – Architecture, Programming and Design', Tata McGraw Hill, 2017.
2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.

REFERENCES

1. Raj Kamal, "Internet of Things – Architecture and Design Principles", Mc Graw Hill Education Pvt. Ltd., 2017.
2. Internet of Things and Data Analytics, Hwaiyu Geng, P.E, Wiley Publications, 2017.
3. Manoel Carlos Ramon, ―Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers‖, Apress, 2014.
4. Marco Schwartz, ―Internet of Things with the Arduino Yun‖, Packt Publishing, 2014..

U19EE504 ELECTRICAL MACHINE DESIGN 2 1 0 3

COURSE OUTCOMES:

At the end of this course the students will be able to,

1. Explain the design basics of magnetic circuit and loadings of an electrical machine.
2. Calculate the design parameters of DC machine.
3. Calculate the design parameters of squirrel cage and slip ring three-phase induction motors.
4. Calculate the design parameters of turbo alternators and salient pole synchronous machines.
5. Calculate the parameters of transformer dimensions and design its cooling tank.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	1	-	1	-	-	2	3	3
CO2	3	3	3	3	-	-	1	-	1	-	-	2	3	3
CO3	3	3	3	3	-	-	1	-	1	-	-	2	3	3
CO4	3	3	3	3	-	-	1	-	1	-	-	2	3	3
CO5	3	3	3	3	-	-	1	-	1	-	-	2	3	3

UNIT I MAGNETIC CIRCUIT DESIGN PRINCIPLES 9

Considerations, factors, limitations and principles of design – fundamentals of magnetic circuits – comparison of magnetic and electric circuits – MMF for airgap and teeth – net length of iron – real and apparent flux densities – Total and specific loadings – factors affecting size of rotating machines – choice of specific magnetic and electric loadings.

UNIT II DESIGN OF DC MACHINES 9

Output equation – main dimensions: separation of D and L – choice of number of poles – core length, armature diameter – pole proportions – Armature design: number of armature coils, and slots – Pole design – design of shunt field winding – design of commutator and brushes.

UNIT III DESIGN OF THREE PHASE INDUCTION MOTORS 9

Output equation – main dimensions: separation of D and L – Stator design: winding, number of slots, area of slots – Squirrel cage rotor design: bars, slots and end rings – Wound rotor design: turns and area of conductors.

UNIT IV DESIGN OF SYNCHRONOUS MACHINES 9

Output equation – runaway speed – main dimensions: separation of D and L – Short circuit ratio – design of armature and rotor of salient pole machines – design of damper winding – design of field winding – design of stator and rotor of turbo alternators.

UNIT V DESIGN OF TRANSFORMERS 9

Classification – output equations – volt per turn – optimum designs – design of core, windings, and yoke – window dimensions – overall dimensions – temperature rise – design of tank with cooling tubes.

Lecture: 30 Hours, Tutorial: 15 Hours, Total: 45 Hours.

TEXTBOOKS:

1. Sawhney A.K. & Chakrabarti A, "A Course in Electrical Machine Design", Dhanpat Rai & Co., VI Edition, 2016.
2. Deshpande MV, "Design and Testing of Electrical Machines", PHI learning, III edition, 2010.

REFERENCES:

1. A. Nagoor Kani, "Electrical Machine Design", RBA publications, II edition, 2014.
2. Agarwal R.K., "Principles of Electrical Machine Design", S.K.Kataria and Sons, V edition, 2014.
3. Sen S.K., "Principle of Electrical Machine Design with C++", Oxford & IBH Publishing, III edition, 2014.
4. KM Vishnu Murthy, "Computer-Aided Design of Electrical Machines", BS publications, 2015.

U19EE505 TOTAL QUALITY MANAGEMENT IN ELECTRICAL INDUSTRIES 3 0 0 3

COURSE OUTCOMES

At the end of this course the students will be able to,

1. Explain the fundamental concepts and principles of total quality management (TQM) along with the contributions of quality gurus.
2. Discuss the various statistical tools used for quality control.
3. Illustrate the techniques of quality which are widely practiced in organizations.
4. Discuss the fundamental concepts of ISO 9001:2015 and ISO 50001:2011 standards and quality awards.
5. Explain the concepts of world class manufacturing.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	2	-	3	2	3	3	1	3	3	1	1
CO2	1	2	3	2	-	3	2	3	3	1	3	3	1	1
CO3	1	2	3	2	-	3	2	3	3	1	3	3	1	1
CO4	1	2	3	2	-	3	2	3	3	1	3	3	1	1
CO5	1	2	3	2	-	3	2	3	3	1	3	3	1	1

UNIT I EVOLUTION OF QUALITY 9

Quality control – quality assurance – total quality management – core concepts – quality gurus and their contribution – quality costs – quality measurement.

UNIT II STATISTICAL PROCESS CONTROL IN INDUSTRY 9

Statistical quality control – quality control vs process control – control charts – applications – problems – seven tools of quality – seven tools of management – implementation in electrical industry.

UNIT III TECHNIQUES OF QUALITY IN INDUSTRY 9

TQM tools: Quality Function Deployment (QFD) – Failure Modes and Effect Analysis (FMEA) – applications in industry. Process approach and improvement: just in time – KANBAN – 5S principle in industry – zero defects – poka yoke – SMED-Quality circles.

UNIT IV QUALITY SYSTEMS AND AWARDS 9

ISO 9001:2015 and ISO 50001:2011: philosophy – elements – requirements – benefits – procedure – documentation – certification – auditing – implementation in organization – awards: MBNQA, EQA, RGNQA.

UNIT V WORLD CLASS MANUFACTURING 9

Six sigma – lean manufacturing – lean six sigma – theory of constraints – agile manufacturing – Advanced product quality planning (APQP) in automotive industry.

Lecture: 45, Tutorial: 0, TOTAL: 45 Hours

TEXT BOOKS:

1. Ramasamy, Subburaj, "Total Quality Management", 7th reprint McGrawHill,2016.
2. Dale H. Besterfield, Carol Besterfield-Michna, Glen Besterfield and Mary Besterfield-Sacre,"Total Quality Management", Third edition, Pearson Education, 2013.

REFERENCES:

1. Dahlgaard Jens J; Kristensen Kai; Kanji Gopal K, "Fundamentals of Total Quality Management: process analysis and improvement" , Nelson Thornes Ltd, 2010
2. James R.Evans& William M.Lidsay, "The Management and Control of Quality", Eighth Edition, South – Western (Thomson Learning), 2011.
3. Dr. V. Jayakumar and Dr. R. Raju, "Total Quality Management" , Lakshmi Publications, third revised edition, 2016.
4. https://www.iso.org/popular-standards.html

noc21-ge23 SOLAR ENERGY ENGINEERING AND TECHNOLOGY 3 0 0 3

COURSE DURATION: 12 weeks (26 Jul' 21 - 15 Oct' 21)

PRE-REQUISITES: Basic knowledge of heat transfer, thermodynamics, and fundamentals of physics

INTENDED AUDIENCE: UG, PG and Doctorate students

INDUSTRIES APPLICABLE TO: This course will be very much effective for the engineers working in the solar industries.

COURSE OUTLINE:
The course content is designed to provide comprehensive knowledge on solar radiation, analysis of solar radiation data, fundamentals of the solar thermal and photovoltaic system along with storage of energy required for effective design of efficient solar energy conversion devices. The concepts will be illustrated with practical examples, schematics and block diagrams wherever required. A sufficient number of numerical problems with solutions will be discussed in the course. This course is specifically designed for undergraduate and postgraduate students of Energy Engineering and Technology. Further, the course will be very much useful for students and researchers from varied academic backgrounds for the synthesis of novel energy conversion devices and processes.

COURSE PLAN:
Week 1: Energy Scenario, overview of solar energy conversion devices and applications, physics of propagation of solar radiation from the sun to earth
Week 2: Sun-Earth Geometry, Extra-Terrestrial and Terrestrial Radiation, Solar energy measuring instruments
Week 3: Estimation of solar radiation under different climatic conditions, Estimation of total radiation
Week 4: Fundamentals of solar PV cells, principles and performance analysis, modules, arrays, theoretical maximum power generation from PV cells
Week 5: PV standalone system components, Standalone PV-system design.
Week 6: Components of grid-connected PV system, solar power plant design and performance analysis.
Week 7: Fundamentals of solar collectors, Snails law, Bougers law, Physical significance of Transmissivity - absorptivity product.
Week 8: Performance anlaysis of Liquid flat plate collectors and testing
Week 9: Performance anlaysis of Solar Air heaters and testing
Week 10: Solar thermal power generation (Solar concentrators).
Week 11: Thermal Energy Storage (sensible, latent and thermochemical) and solar pond
Week 12: Applications: Solar Refrigeration, Passive architecture, solar distillation, and ermeging technologies.

U19EE506 INSTRUMENTATION AND CONTROL LABORATORY 0 0 2 1

COURSE OUTCOMES:

At the end of the course student should be able to,

1. Measure electrical parameters using suitable circuit arrangement.
2. Determine the transfer function of servomotors and analyse time response.
3. Evaluate response and stability of a linear system.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	3	1	2	3	3	3
CO2	3	3	3	3	3	-	-	-	3	1	2	3	3	3
CO3	3	3	3	3	3	-	-	-	3	1	2	3	3	3

LIST OF EXPERIMENTS

Instrumentation

1. Measurement of low and medium resistances using suitable bridges.
2. Measurement of inductances and capacitances using suitable bridges.
3. Measurement of single-phase power using current and potential transformers.
4. Determination of characteristics of displacement, pressure, and temperature transducers.

Control Systems

5. Determination of characteristics of DC position control system and AC synchro.
6. Determination of transfer function of armature-controlled and field-controlled DC servomotor.
7. Determination of transfer function of separately excited DC generator.
8. Design and analysis of P, PI and PID controllers.
9. Step response analysis of first and second order systems.
10. Stability analysis of linear time invariant systems (Root locus, Bode, and Nyquist plots).
11. Determination of state space representation of the given transfer function and vice versa.
12. Test of controllability and observability in linear continuous time domain state model.

Total: 30 Hours

U19EE507 EMBEDDED SYSTEMS AND IOT LABORATORY 0 0 2 1

COURSE OUTCOMES

At the end of this course the students will be able to

1. Design an embedded system to get input from various sensor modules, monitor and display in the LED display.
2. Deploy an IoT application using Arduino/Raspberry Pi and appropriate sensor and actuator for monitoring.
3. Design an industrial based IoT system by interfacing analog and digital sensors with embedded controllers using LoRaWAN communication protocol.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3	2	1	3	2	1	1	1	3	2	3
CO2	2	3	2	3	2	1	3	2	1	1	1	3	2	3
CO3	3	3	2	3	2	1	3	2	1	1	1	3	2	3

The interfacing, programming and simulation of the following experiments are done with Arduino board& IDE/Raspberry Pi/Python.

List of experiments:

1. LED blinking, push button / slide switch based led/buzzer control.
2. Integrating OLED display with Raspberry Pi to display "Hello World".
3. Monitoring temperature & humidity of environment using SHT31 temperature sensor in IOT cloud platform and display it in OLED display.
4. Monitoring accelerometer, gyroscope value using ADXL345 sensor and monitor no movement alert in IOT cloud platform and display it in OLED display.
5. Monitoring soil moisture data and control the contactor/starter of the motor to ON/OFF using IOT cloud platform.
6. Monitoring motion detection using PIR sensor and control the relay for light ON/OFF & update the status change to IOT cloud platform.
7. Monitoring water level of a tank using ultrasonic sensor and control contactor/starter of the motor from IOT cloud platform.
8. Control Rotation of 180 Degree Servo Motor from IOT Cloud Platform.
9. Monitoring temperature & humidity of environment using SHT31 temperature sensor in IOT cloud platform using LoRaWAN communication.
10. Electrical appliances control using LoRaWAN communication

Total: 30 Hours

B-E-V Sem
2019-Batch

Semester –V	U19GE501 : SOFT SKILLS AND APTITUDE - III	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes
At the end of the course the student will be able to:

1. Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches
2. Solve problems of advanced levels than those in SSA-II in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests
3. Demonstrate greater than SSA-II level of verbal aptitude skills in English with regard to given topics and score 70-75% marks in company-specific internal tests

1.SOFT SKILLS

Demonstrating soft-skill capabilities with reference to the following topics:

a. **Career planning:** Importance; Exploring various career options, Field research, Social media management; Process, benefits and limitations of career planning; Mapping SWOT and GOALS to career planning; Self-evaluation

b. **Resume writing :** Build credentials and resume, Positioning yourself and your career, JD mapping, Video resume, Relevant resume phrases and components; Cover letter; Portfolio management and Social media cover

c. **Group discussion :** Skills needed for GD; Frequently Asked topics and Practice; Types of topics; Various framework and tools to handle GD; Practice and assessment

d. **Teamwork :** Definition and importance of team-building; Stages of team-building; Communication within a team; Various styles of teams and their analysis; Activities demonstrating a team

e. **Leadership skills :** Role of a leader; Difference between a manager and a leader; Various Leadership styles; Compelling qualities of a leader; Famous leaders and their impact to the world; Self-assessment

f. **Interview skills :** Process and types of interview; Appearance and grooming etiquette; Do's and Don'ts (Before – During interview); Brainstorming interview possible questions; Hot seat; Transactional Analysis for effective communication and handling interviewers; mock interviews and assessment parameters discussion

g. **Mock interviews :** Frequently Asked Questions practice and assessment; Discussion and demonstrations on Stress and Technical interviews; Group interview

h. **Mock GDs :** Frequently Asked Topics Practice; Assessment and feedback

2.QUANTITATIVE APTITUDE AND LOGICAL REASONING	**Solving problems with reference to the following topics :** a. **Geometry:** 2D, 3D, Coordinate Geometry, and Height & Distance. b. **Permutation & Combinations :** Principles of counting, Circular Arrangements and Derangements. c. **Probability:** Addition & Multiplication Theorems, Conditional Probability and Bayes Theorem. d. **Statistics :** Mean Median, Mode, Range and Standard Deviation. e. **Interest Calculation :**Simple Interest and Compound Interest f. **Crypto arithmetic:** Addition and Multiplication based problem. g. **Logical Reasoning :**Blood Relations, Directions Test, Series, Odd man out, Analogy, Coding & Decoding, Problems and Input – Output Reasoning. h. Statement & Assumptions, Statements & Arguments, Inference. i. **Company Specific Pattern :**Infosys and TCS company specific problems
3. VERBAL APTITUDE	**Demonstrating English language skills with reference to the following topics:** a. Subject verb agreement b. Selecting the best alternative for the stated parts of given sentences c. Reading comprehension d. Contextual synonyms e. Sentence fillers f. Writing a story for a given picture g. Company specific aptitude questions

Dr.S.Anita

Head/Training

Department of Placement Training
Sona College of Technology,
Salem-636 005.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VI Regulations 2019
Branch: Electrical and Electronics Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19EE601	Power System Analysis	3	1	0	4	60
2	U19EE602	Power System Protection and Switchgear	3	0	0	3	45
3	U19EE603	Special Electrical Machines and their Controllers	3	0	0	3	45
4	U19EE918	**Elective** - Renewable Energy Sources	3	0	0	3	45
5	U19EE919	**Elective** - Power Quality Engineering	3	0	0	3	45
6	U19CS1002	**Open Elective** - Cloud Computing	3	0	0	3	45
	U19CS1004	**Open Elective** - Mobile Application Development					
	U19CS1006	**Open Elective** - Data Science					
	U19EC1003	**Open Elective** - Sensors and Smart Structures Technologies					
	U19EC1006	**Open Elective** - Mobile Technology and its Applications					
	U19EE1003	**Open Elective** - Innovation, IPR and Entrepreneurship Development					
	U19IT1001	**Open Elective** - Problem Solving Techniques using Java Programming					
	U19MC1003	**Open Elective** - Smart Automation					
Practical							
7	U19EE604	Mini Project	0	0	6	3	90
8	U19ENG601	Communication Skills Laboratory	0	0	2	1	30
9	U19GE601	Soft Skills and Aptitude - IV	0	0	2	1	30
Total Credits						**24**	

Approved By

Chairperson, Electrical and Electronics Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.S.Padma	Dr.R.Shivakumar	Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electrical and Electronics Engineering, Sixth Semester BE EEE Students and Staff, COE

U19EE601 POWER SYSTEM ANALYSIS 3 1 0 4

COURSE OUTCOMES:

At the end of this course the students will be able to,

1. Model the various power system components and formation of Y-bus matrix.
2. Solve the power flow equation for power system networks using iterative techniques.
3. Analyze the symmetrical faults for the power system networks using bus impedance matrix formulation.
4. Analyze the unsymmetrical faults for the power system networks using symmetrical components.
5. Model the power system for stability analysis using iterative methods.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	2	2	2	1	3	2	3	3	3
CO2	3	3	3	3	2	2	2	2	1	3	2	3	3	3
CO3	3	3	3	3	2	2	2	2	1	3	2	3	3	3
CO4	3	3	3	3	2	2	2	2	1	3	2	3	3	3
CO5	3	3	3	3	2	2	2	2	1	3	2	3	3	3

UNIT I POWER SYSTEM MODELLING 12

Need for system analysis in planning and operation of power system – modelling of synchronous generator and motor, transformer and transmission line – per unit system– change of base – impedance and reactance diagrams, Y-bus formulation by direct inspection and singular transformation methods.

UNIT II POWER FLOW ANALYSIS 12

Problem definition –bus classification – derivation of power flow equation – power flow solution by Gauss Seidel – computation of slack bus power, transmission loss and line flow – Newton Raphson and fast decoupled methods (qualitative treatment only)comparison of solution techniques.

UNIT III SYMMETRICAL FAULT ANALYSIS 12

Need for short circuit study – approximations in modelling – fault MVA – symmetrical short circuit analysis – Thevenin's equivalent representation –bus impedance matrix formulation – bus building algorithm – symmetrical fault calculations using bus impedance matrix.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS 12

Unsymmetrical fault analysis – symmetrical component transformation – sequence impedances – sequence networks – types of unsymmetrical fault – unsymmetrical fault analysis on an unloaded generator – unsymmetrical fault analysis on power system.

UNIT V STABILITY ANALYSIS 12

Concept of stability in power system – steady and transient state stability – rotor angle stability–voltage stability – swing equation – power angle equation and curve – equal area criterion – critical clearing angle and time – solution of swing equation by modified Euler's method and Runge-Kutta method (qualitative treatment only).

Lecture: 45, Tutorial: 15, TOTAL: 60 Hours

TEXT BOOKS:

1. Nagrath.I.J, Kothari.D.P, "Modern Power System Analysis", Tata McGraw Hill, 3rd Ed., 2003.
2. P. Venkatesh, B.V.Manikandan, S. Charles Raja, A. Srinivasan, "Electrical Power Systems", 2nd Edition, PHI Publications, 2017.

REFERENCES:

1. Hadi Saadat, "Power System Analysis", Tata McGraw Hill Pub Co. Ltd., New Delhi, 2002**.**
2. Gupta, J.B., "A Course in Electrical Power", S.K.Kataria and Sons, 2009.
3. Stagg.G.W, and El-Abaid.A.H., "Computer Methods in Power System Analysis", Tata McGraw Hill Pub Co. Ltd, New Delhi, 1993.
4. John J. Grainger & William Stevenson JR., "Power system Analysis by Tata McGraw-Hill New Delhi, 1st Ed., 2003

U19EE602 POWER SYSTEM PROTECTION AND SWITCHGEAR 3 0 0 3

COURSE OUTCOMES:

At the end of this course the students will be able to,

1. Discuss the need for protection and classify relays.
2. Identify, apply, and calculate settings for overcurrent, directional overcurrent, distance and differential protection relays.
3. Discuss protection schemes of generator, transformer, bus bars and transmission lines.
4. Describe the method of circuit breaking and types of circuit breakers.
5. Illustrate the causes and methods of protection against over voltages and insulation co-ordination in power system.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1			3	3	1		2		2	3	3
CO2	2	3	3	2	2	3	3	1	1	2		2	3	3
CO3	3	3	3	3	2	3	3	1		2	1	2	3	3
CO4	3	2	2	2	3	3	3	1		2		2	3	3
CO5	2	3	3	3	3	3	3	2		2	1	2	3	3

UNIT I INTRODUCTION 9

Need for protection – Nature and causes of faults – Types of Faults – Zones of Protection – Primary and Back-up protection - essential qualities of Protection – classification of protective relays – classification of Protective schemes – Instrumentation transformers.

Electromechanical Relays – types - Static relays- Comparators - Numerical Relays

UNIT II PROTECTIONAL RELAYS 9

Overcurrent Relays: Characteristics – Current setting, Time setting – Protective schemes – Directional relay – Earth Fault relay. Distance Relay: Impedance relay – Reactance relay – MHO relay –Quadrilateral relay. Differential Relays: Types – simple differential relay, Percentage differential relay, balanced voltage differential relay. Under frequency relays – Negative sequence relays.

UNIT III APPARATUS PROTECTION 9

Apparatus protection – generator and transformer protection – protection of bus bars, transmission lines, CTs & PTs and their application in protective schemes.

UNIT IV CIRCUIT BREAKER 9

Physics of arc phenomena and arc interruption – re-striking voltage & recovery voltage, rate of rise of recovery voltage, current chopping, interruption of capacitive current, resistance switching – DC circuit breaking.

Types of circuit breakers: air circuit breakers, oil circuit breakers, SF6 circuit breakers and vacuum circuit breakers – comparison of circuit breakers, Rating and selection of circuit breakers. Introduction to Isolators and Gas Insulated Substation.

UNIT V PROTECTION AGAINST OVER VOLTAGES 9

Causes of over voltages – Lightning phenomena – overvoltage protection due to lightning and switching - methods of protection against over voltages – ground wires, Peterson coil, surge absorbers, surge diverters – relay co-ordination – selection of Protective system – Insulation co-ordination.

Lecture: 45; Tutorial: 0; TOTAL: 45 Hours

TEXT BOOKS:

1. Badri Ram and B.H.Vishwakarma, "Power System Protection and Switchgear", Tata McGraw Hill Education Pvt. Ltd, 2017.
2. Ravindranath.B and Chander.N, "Power System Protection and Switchgear", New Age international Publishers, 2011.

REFERENCES:

1. Chakrabarti.A, Soni.M.L, Bhatnagar.U.S., & Gupta.P.V, "A text book on Power System Engineering", Dhanpat rai & Co. pvt.ltd., 2013.
2. C.L. Wadhwa, "Electrical Power Systems", New Age International (P) Ltd., 2016.
3. RavindraP.Singh , " Digital Power System Protection" , PHI , New Delhi, 2007.
4. Sunil S. Rao, "Switchgear and Protection", Khanna Publishers, 13th Edition, 2015.

U19EE603 SPECIAL ELECTRICAL MACHINES AND THEIR CONTROLLERS 3 0 0 3

COURSE OUTCOMES:

At the end of this course, students will be able to

1. Categorize the stepping motors, analyse its performance characteristics for given excitation mode and develop the drive circuit.
2. Explain the operating principle and control techniques for Switched Reluctance Motor.
3. Explain the operating principle and control techniques for Permanent Magnet Brushless DC motor.
4. Explain the operating principle and analyse the characteristics of Permanent Magnet Synchronous Motor.
5. Explain the construction, operating principle and application of Synchronous Reluctance and Linear Induction motor.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	2	2	2	-	-	-	2	2	3	2
CO2	3	3	3	-	2	2	2	-	-	-	2	2	3	2
CO3	3	3	3	-	2	2	2	-	-	-	2	2	3	2
CO4	3	3	3	-	2	2	2	-	-	-	2	2	3	2
CO5	3	3	3	-	2	2	2	-	-	-	2	2	3	2

UNIT I STEPPING MOTORS 9

Constructional features – principle of operation – variable reluctance, permanent magnet and hybrid motors – torque equations – modes of excitations – static and dynamic characteristics – drive circuits – logic circuits using JK flip flops – application.

UNIT II SWITCHED RELUCTANCE MOTORS 9

Constructional features – principle of operation – static torque production – energy conversion loop – effect of saturation – torque speed characteristics – power converters and their controllers – rotor position sensing – closed loop control of SRM –applications.

UNIT III PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Permanent magnet materials – demagnetization characteristics – permeance coefficient – limitation of DC motor – construction – EMF and torque equations – six-step commutation – controller for BLDC motor drive – torque speed characteristics – applications.

UNIT IV PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Principle of operation – ideal PMSM – EMF, torque and inductance equations – sine wave motor with practical windings – phasor diagram – circle diagram and torque – speed characteristics – power controllers – converter volt-ampere requirements.

UNIT V SYNCHRONOUS RELUCTANCE MOTOR 9

SynRM: Constructional features – Axial and Radial Type - Operating principle – Variable reluctance – Voltage and Torque equation - Performance characteristics – advantages - Linear Induction motor: Construction and operating principle - Application.

Lecture: 45; Tutorial: 0; Total: 45 Hours

TEXT BOOKS:

1. R. Srinivasan, "Special Electrical Machines", Lakshmi Publications, fifth edition 2013.
2. E.G. Janardanan, "Special Electrical Machines", PHI Learning Private Limited, Delhi, 2014.

REFERENCES:

1. T. Kenjo, "Stepping Motors and Their Microprocessor Controls", Clarendon Press London, 1984.
2. T.J.E. Miller, "Brushless Permanent Magnet and Reluctance Motor Drives", Clarendon Press, Oxford, 1989.
3. R.Krishnan, "Switched Reluctance Motor Drives – Modelling, Simulation, Analysis, Design and Application", CRC Press, New York, 2001.
4. Benjamin C. Kuo, "Theory and Applications of Step Motors" West Publishing Company. 1983.

U19EE604 **MINI PROJECT** **0 0 6 3**

The mini project is introduced to develop practical skills to solve real time problems related to the industry in the field of electrical and electronics engineering. This course will also develop investigative, research, report writing skills and work in team; it provides an opportunity to learn a chosen topic in considerable depth.

COURSE OUTCOMES:

At the end of this course, students will be able to

1. Utilize core engineering knowledge to identify an issue related to society, environment, engineering and technology.
2. Formulate, analyze and develop a prototype for the identified problem.
3. Evaluate the solution and compile the report for oral presentation.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	1	3	3	3	3
CO2	1	3	3	3	3	2	3	3	3	2	3	3	3	3
CO3	3	3	2	1	3	2	2	2	3	3	3	3	3	3

Description:

- Project work should be done batch wise with the strength of maximum four members per team.
- Identify the thrust area and choose the title of the project.
- All must be present for all the three project reviews as per the schedule.
- Develop an innovative prototype or simulation model.
- Prepare a comprehensive project report for final viva-voce examination

Total: 90 Hours

U19EE918 RENEWABLE ENERGY SOURCES 3 0 0 3

COURSE OUTCOMES

At the end of this course the students will be able to,

1. Describe the global power demand scenario and the prospects of renewable energy sources in meeting this demand
2. Explain the principle of operation and the applications of solar thermal and electrical systems.
3. Illustrate the power generation technologies of wind energy conversion system and biomass energy system
4. Describe the principle of operation and prospects of power generation from geo-thermal, tidal, wave energy and ocean thermal energy systems.
5. Outline the emerging energy generation systems like MHD, thermal hybrid and fuel cell applications.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	3	3					3	3	3
CO2	3	3	3	3	3	3	3					3	3	3
CO3	3	3	3	3	3	3	3					3	3	3
CO4	3	3	3	3	2	3	3					3	3	3
CO5	3	3	3	3	3	3	3					3	3	3

UNIT I INTRODUCTION 9

World energy futures–Energy sources and their availability – Energy cycle of the earth – environmental aspects of energy utilization – Energy plantation- Renewable energy resources and their importance- Prospects of Renewable energy sources.

UNIT II SOLAR ENERGY SYSTEMS 9

Introduction –Solar radiation and measurements-Solar energy collectors-solar energy storage systems- Solar pond and applications-

Solar thermal: applications- cooking, distillation, water heating, greenhouse, power generation- Solar Photovoltaic: Principles and applications- solar pumping, solar power generation.

UNIT III WIND AND BIOMASS ENERGY SYSTEMS 9

Introduction – Wind Energy conversion- Wind speed and power relation – Power extracted from wind – wind distribution and wind speed predictions – types of Wind power systems.

Bio mass conversion technologies-Biogas generation-Types of biogas plants-Bio gas from plant wastes-Utilization of Bio gas and applications.

UNIT IV GEO THERMAL, TIDAL AND OCEAN ENERGY SYSTEMS 9

Geothermal energy – Estimates of Geothermal power- site selection for geothermal power plant-Applications of Geothermal energy.

Origin of tides – Basic principle of Tidal power- Operation of a Tidal power plant-Ocean Thermal Energy conversion system- Open and closed OTEC cycles- Prospects of ocean thermal energy conversion in India.

UNIT V EMERGING ENERGY SYSTEMS 9

Magneto Hydro Dynamic (MHD) Power Generation - MHD systems and its operation- Thermo Electric power generation- Basic principle - Thermo electric power generator-Thermonuclear fusion energy - Nuclear fusion and reactions - Advantages.

Fuel cell - classification of fuel cells - Fuel cell based electrical power generation scheme - Applications.

Lecture: 45; Tutorial: 0; Total: 45

TEXT BOOKS:

1. Rai, G.D., "Non-Conventional Energy Sources", Khanna Publishers, Sixth Edition 2017.
2. Khan, B.H, Non- Conventional Energy Resources", Mc. Graw Hill Education Ltd, third reprint 2017.

REFERENCE BOOK

1. Rao S. Paruklekar, B.B, "Energy Technology – Non Conventional, Renewable and Conventional", KhannaPublishers, 1994.
2. F.Kreith and J.F.Kreider, "Principles of Solar Engineering", McGraw Hill.
3. T.N.Veziroglu, "Alternative Energy Sources", Vol 5 and 6, McGraw Hill.
4. Mukund R. Patel, "Wind and Solar Power Systems", CRC Press LLC.

U19EE919 POWER QUALITY ENGINEERING 3 0 0 3

COURSE OUTCOMES

At the end of this course student will be able to,

1. Introduce power quality terms and definitions.
2. Understand the concepts on Power factor.
3. Introduce the concepts of Harmonics.
4. Implicit the awareness of harmonics and to know about devices for controlling harmonic distortion.
5. Expose the students to various types of power monitoring equipment.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3			2					3	3	3
CO2	3	2	3	3			2					3	3	3
CO3	3	2	3	3			2					3	3	3
CO4	3	2	3	3	3	2	3					3	3	3
CO5	3	2	3	3	3	2	3					3	3	3

UNIT I INTRODUCTION 9

Definitions – power quality, voltage quality, power quality issues – short duration voltage variations, long duration voltage variations, transients, waveform distortion, voltage imbalance, voltage fluctuation, power frequency variations – sources and effects of power quality problems – power quality terms – power quality and Electro Magnetic Compatibility (EMC), IEEE and IEC standards.

UNIT II POWER FACTOR 9

Introduction – active and reactive power – displacement and true power factor – power factor improvement – power factor correction – power factor penalty – advantages of power factor correction – voltage rise due to capacitance – application of synchronous condensers – static VAR compensators.

UNIT III HARMONICS 9

Definition of Harmonics - Harmonic Number (h), Odd and Even Order Harmonics - Harmonic Phase Rotation and Phase Angle Relationship - Causes of Voltage and Current Harmonics - Individual and Total Harmonic Distortion - Harmonic Signatures, Fluorescent Lighting, Adjustable Speed Drives, Personal Computer and Monitor - Effect of Harmonics on Power System Devices, Transformers, AC Motors, Capacitor Banks, Cables, Busways, Protective Devices.

UNIT IV APPLIED HARMONICS 9

Harmonic distortion evaluations - principles for controlling harmonics - where to control harmonics - harmonic studies - devices for controlling harmonic distortion - harmonic filter design: a case study - standards of harmonics - Guidelines for Harmonic Voltage and Current Limitation.

UNIT V POWER QUALITY MONITORING 9

Need for power quality monitoring, evolution of power quality monitoring, brief introduction to power quality measurement tools – planning, conducting and analysing power quality survey - Power quality monitoring and the Internet - Future applications.

Lecture: 45; Tutorial: 0; Total: 45 Hours

TEXT BOOKS:

1. Roger C. Dugan, Mark F. McGranaghan and H.WayneBeaty, "Electrical Power Systems Quality", McGraw – Hill, New York, 2nd Edition, 2002.
2. Sankaran.C, "Power Quality", CRC Press, Washington, D.C., 2002.

REFERENCES:

1. G.T.Heydt, "Electric Power Quality", Stars in a circle publishers, 1994, 2nd Edition.
2. Barry W.Kennedy, "Power Quality Primer", McGraw – Hill, New York, 2000.
3. Math H.J.Bollen, "Understanding Power Quality Problems: Voltage Sags and Interruptions", IEEE Press, New York, 2000.
4. Arrillaga.J, Watson.N.R and Chen.S, "Power System Quality Assessment", John Wiley & Sons Ltd., England, 2000.

U19ENG601 **Communication Skills Laboratory** **0 0 2 1**

Course Outcome: At the end of the course, the students will be able to

1. Communicate confidently and appropriately in professional environment
2. Demonstrate active interpersonal skill knowledge to excel in their career
3. Use language efficiently to write winning proposals and effective reports, and to face interviews, participate in group discussions and present speeches.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	3	2	2	-	3	3	-	3	2	2
CO2	-	-	-	-	3	2	2	-	3	3	-	3	2	2
CO3	-	-	-	-	3	2	2	-	3	3	-	3	2	2

1. **Listening Comprehension**: listening to audio files and sequencing of sentences – Filling in the blanks – Listening comprehension.
2. **Reading Comprehension**: Filling in the blanks – Cloze exercises – Vocabulary building – Reading and answering questions.
3. **Speaking:** Correct Pronunciation – Common errors in spoken English.

   Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)
4. Making presentations: introducing oneself – introducing a topic – answering questions – individual presentation practice
5. Creating effective PPTs – presenting the visuals effectively
6. Using appropriate body language in professional contexts – gestures, facial expressions, etc.
7. Preparing job applications - writing covering letter and résumé
8. Applying for jobs online - email etiquette
9. Participating in group discussions – understanding group dynamics - brainstorming the topic – mock GD
10. Training in soft skills - persuasive skills – people skills - questioning and clarifying skills
11. Writing Project proposals: collecting, analyzing and interpreting data / drafting the final report
12. Attending job interviews – answering questions confidently
13. Interview etiquette – dress code – body language – mock interview

TOTAL: 30 Hours

Dr. M.RENUGA,
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Sona College of Technology,
SALEM - 636 005.

REFERENCE BOOKS:

1. English and Soft Skills, Dhanavel, S.P. Hyderabad: Orient Black Swan Ltd. 2010.
2. How to Prepare for Group Discussion and Interview, Corneilssen, Joep. New Delhi: Tata-McGraw-Hill, 2009.
3. Group Discussion and Team Building D'Abreo, Desmond A. Mumbai: Better yourself books, 2004.
4. The ACE of Soft Skills, Ramesh, Gopalswamy, and Mahadevan Ramesh. New Delhi: Pearson, 2010.
5. Corporate Soft Skills, Gulati, Sarvesh. New Delhi: Rupa and Co. 2006.
6. Presentation Skills for Students, Van Emden, Joan, and Lucinda Becker. New York: Palgrave Macmillan, 2004.
7. Dictionary of Common Errors, Turton, N.D and Heaton, J.B. Addision Wesley Longman Ltd., Indian reprint 1998.

EXTENSIVE READING

1. The 7 Habits of Highly Effective People, Covey, Stephen R. New York: Free Press, 1989.
2. The Professional, Bagchi, Subroto. New Delhi: Penguin Books India, 2009.

Dr. M.RENUGA,
Professor & Head,
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...a College of Technology,
SALEM - 6.

Semester –VI	U19GE601-SOFT SKILLS AND APTITUDE – IV (Common to All except Civil)	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

At the end of the course the student will be able to:

1. Demonstrate capabilities in job-oriented company selection processes using the hands-on approach
2. Solve problems of any given level of complexity in all areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests
3. Demonstrate advanced-level verbal aptitude skills in English and score 70-75% marks in company-specific internal tests

1. Soft Skills	**Demonstrating Soft -Skills capabilities with reference to the following topics:** a. Mock group discussions b. Mock interviews c. Mock stress interviews
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. Functions and Polynomials b. Clocks and Calendars c. Data Sufficiency: Introductions, 3 Options Data Sufficiency, 4 Options Data Sufficiency and 5 Options Data Sufficiency. d. Logical reasoning: Cubes, Non Verbal reasoning and Symbol based Reasoning. e. Decision making table and Flowchart Campus recruitment papers: Solving of previous year questions paper of all major recruiters f. Miscellaneous: Cognitive gaming Puzzles-(Picture, Word and Number based), IQ Puzzles, Calculation Techniques and Time Management Strategies. g. Trigonometry.- Concepts
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Writing captions for given pictures b. Reading comprehension c. Critical reasoning d. Theme detection e. Jumbled sentences f. Writing a story on given pictures g. Company specific verbal questions

Dr.S.Anita

Head/Training

Department of Placement Training

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VII under Regulations 2019
Branch: Electrical and Electronics Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	U19GE701	Professional Ethics and Human Values	3	0	0	3	45
2	U19EE914	**Professional Elective** – Advanced Electrical Drives	3	0	0	3	45
3	U19EE916	**Professional Elective** – Power System Operation and Control	3	0	0	3	45
4	U19EE923	**Professional Elective** – Electrical Energy Conservation and Auditing	3	0	0	3	45
5	U19CE1004	**Open Elective -** Disaster Management	3	0	0	3	45
	U19CS1001	**Open Elective -** Big Data Analytics					
	U19CS1002	**Open Elective -** Cloud Computing					
	U19CS1006	**Open Elective -** Data Science					
	U19EC1002	**Open Elective -** Embedded and Real Time Systems					
	U19EC1005	**Open Elective -** Signal and Image Processing					
	U19EC1007	**Open Elective -** CMOS VLSI Design					
	U19EE1003	**Open Elective -** Innovation, IPR and Entrepreneurship Development					
	U19FT1001	**Open Elective -** Fundamentals of Fashion Design					
	U19FT1002	**Open Elective -** Garment Manufacturing Technology					
	U19MC1003	**Open Elective -** Smart Automation					
	U19MC1004	**Open Elective -** Fundamentals of Robotics					
Practical							
6	U19EE701	Power Systems Laboratory	0	0	4	2	60
					Total Credits	**17**	

Approved By

Chairperson, Electrical and Electronics Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.S.Padma	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Electrical and Electronics Engineering, Seventh Semester BE EEE Students and Staff, COE

COURSE OUTCOMES

At the end of the course, the students will be able to:

1. Categorize various electrical drives and select a drive for a particular application based on power rating.
2. Analyse the various semiconductor controlled drives employing for various dc motors.
3. Explain the operation and performance of speed control practices in induction motor.
4. Discuss the various soft computing techniques applied for electrical drives and special machines.
5. Describe the various real-time applications of electrical drives.

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	3	3	2	-	-	3	3	3	3
CO2	3	3	3	3	3	2	2	2	-	-	3	3	3	3
CO3	3	2	2	2	3	2	2	2	-	-	3	3	3	3
CO4	3	3	3	3	3	3	3	2	-	-	3	3	3	3
CO5	3	3	3	3	3	3	3	3	-	-	3	3	3	3

UNIT I DYNAMICS OF ELECTRICAL DRIVES 9

Introduction of drives - block diagram of drive - part of electrical drive - types of load – speed torque conventions and multi-quadrant operation – components of load torque – nature and classification of load torque – steady state stability of an electrical drive - analysis of single quadrant chopper drives - regenerative braking control - two quadrant chopper drives - four quadrant chopper drives.

UNIT II DC MOTOR DRIVES 9

DC motor drives - constant torque and constant power operation, separately excited DC motor drives using controlled rectifiers, single phase semi converter and single phase fully controlled converter drives - three phase semi converter and fully controlled converter drives - dual converters, applications of dual converter for speed control of DC motor - closed loop control of separately excited DC motor drive.

UNIT III AC MOTOR DRIVES 9

Three phase induction motor speed control - stator voltage control – stator frequency control – stator voltage and frequency control (V/f) - rotor chopper speed control – slip power recovery control schemes – basic principle of cyclo-converters – types.

UNIT IV CONTROL TECHNIQUES FOR ELECTRIC DRIVES 9

Speed control of a separately excited DC drive with inner current loop and outer speed loop - soft computing control: self tuning control - model referencing adaptive control (MRAC) - sliding mode control - application of drive in synchronous motor and BLDC machine drive.

UNIT V APPLICATIONS OF AC AND DC DRIVES 9

DSP controlled electrical drive – motor suitable for pump drive – solar powered pump drives -battery powered vehicles – solar powered electrical vehicles, electric traction services – electric trains – electric buses and trolleys.

Lecture: 45, Tutorial: 00, Total: 45Hours

TEXT BOOK:

1. Gopal K Dubey, "Fundamentals of Electric Drive", Narosa Publications, II Edition, 2010.
2. Bimal K. Bose "Modern Power Electronics and AC Drives" Pearson Education, Asia 2015.

REFERENCES:

1. R. Krishnan, 'Electric Motor & Drives Modeling, Analysis and Control', Prentice Hall of India, 2015.
2. Vedam Subramanyan, "Thyristor control of Electrical Drives", Tata McGraw Hill, 2014.
3. W. Shepherd, L. N. Hulley and D. T. Liang, "Power Electronics and Motor Control", Second Edition, Cambridge University Press, 2004.
4. Eiben A. E. and Smith J. E., "Introduction to Evolutionary Computing", Second Edition, Springer, Natural Computing Series, 2015.

U19EE916 POWER SYSTEM OPERATION AND CONTROL 3 0 0 3

COURSE OUTCOMES

At the end of this course student will be able to,

1. Explain the load characteristics of power systems.
2. Explain Economic dispatch and Unit Commitment solutions to power systems.
3. Model the single and multi-area systems and to analyze the system performances.
4. Model the various excitation system components; analyze the system performance and different voltage control methods.
5. Explain the various components used in computer control of power systems and state estimation.

CO / PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2		2					2	2	3	2
CO2	3	3		3	2		2	2		2		2	2	3
CO3	3	3	2	3	3				2	2	2	2	2	3
CO4	3	2		3	2	2		2		2		2	2	3
CO5	3	2	2	2	2	2	2	2	2		2	3	3	2

UNIT-I INTRODUCTION 9

System load variation - System load characteristics - load curves – daily, weekly and annual, load duration curve, load factor, diversity factor – problems - Need for voltage and frequency regulations in power system - basic P – f and Q – V control loops – Overview of Power system control- Overview of system operation.

UNIT – II SYSTEM OPERATION 9

Economic dispatch – Input-output curve of a generating unit - Optimum economic dispatch (lossless) - Economic load distribution (Including losses)- Unit Commitment – Introduction - Statement of Unit Commitment (UC) problem - constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints - Priority-list method.

UNIT-III REAL POWER - FREQUENCY CONTROL 9

Fundamentals of speed governing mechanisms and modeling - Concept of control area - LFC control of a single area - Static and dynamic analysis of uncontrolled and controlled cases - multi-area systems – two area LFC system modelling - Static analysis for uncontrolled case.

UNIT-IV REACTIVE POWER–VOLTAGECONTROL 9

Excitation systems - Introduction - Types of excitation systems - DC, AC, Static - Recent developments and future trends – Modelling of typical excitation system-Methods of voltage control - Shunt capacitors, series capacitors, shunt reactors – Comparison- Synchronous condenser – Tap changing transformer.

UNIT-V AUTOMATION IN POWER SYSTEMS 9

Introduction - Energy management system (EMS) - Energy control centre – SCADA – System hardware configuration –Master station – RTU- functional aspects – Power system security - Security analysis and control – State estimation- Weighted Least Square Estimation- State transition diagram – Control strategies.

Lecture: 45, Tutorial: 0, Total: 45Hours

TEXT BOOKS:

1. Olle I. Elgerd, "Electric Energy and System Theory – An Introduction", Tata McGraw Hill Publishing Company, New Delhi. 2nd edition 2017.
2. Allen J.Wood and Bruce F.Wollenberg, "Power Generation Operation and Control", Wiley – India, reprint edition, 2015.

REFERENCES:

1. V.K Mehta "Principles of Power System" S.Chand & Co Ltd, 2016.
2. M. Jeraldin Ahila, "Power System Operation and Control", Lakshmi Publications, 2018.
3. Mahalanabis A.K., Kothari D.P and Ahson S.I., "Computer Aided Power System Analysis and Control", Tata McGraw Hill Publishing Company, New Delhi, 1990.
4. Prabha Kundur, "Power System Stability and Control", McGraw Hill Pub. Co., 1994.

U19EE923 ELECTRICAL ENERGY CONSERVATION AND AUDITING 3 0 0 3

COURSE OUTCOMES:

At the end of the course the students will be able to

1. Assess role of energy in global economic development.
2. Explain methodology of energy audit and concept of instruments used.
3. Discuss various lamps and design energy efficient illumination schemes.
4. Apply energy conservation concepts in buildings.
5. Identify the energy conserving opportunities in utilities.

CO / PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	3	3	-	-	-	-	2	3	2
CO2	3	3	3	3	3	3	2	-	-	-	-	2	3	2
CO3	3	3	3	3	3	3	3	-	-	-	-	2	3	2
CO4	3	3	3	3	3	3	3	-	-	-	-	2	3	2
CO5	3	3	3	3	3	3	3	-	-	-	-	2	3	2

UNIT I ENERGY SCENARIO AND BASICS 9

Classification of energy –purchasing power parity –energy security –strategy to meet future energy requirements –objectives and features for electricity act 2003 – energy efficiency standards and labelling –study of global and Indian primary energy reserves –study of energy scenario for India –energy and environment – global environmental issues –types of energy –electrical and thermal energy basics –energy units and conversions.

UNIT II ENERGY MANAGEMENT AND AUDIT 9

Definition and objectives of energy management and audit – need for energy audit – types of energy audit – methodology for conducting detailed energy audit – ENCON opportunities and measures – energy audit report. energy costs – benchmarking – energy performance – fuel and energy substitution – instruments and metering for energy audit – basic principles, components of material and energy balance – Sankey diagram – financial analysis terms – payback period, ROI, NPV, IRR.

UNIT III LIGHTING SYSTEMS 9

Introduction – terms in lighting and illumination – light sources - lamp types – arc lamps, vapour lamps – incandescent lamp, fluorescent lamp – energy saving lamps – CFL, LED – Lighting design for interiors –indoor and outdoor lighting schemes – energy saving opportunities – energy efficient lighting controls.

UNIT IV ENERGY CONSERVATION IN BUILDINGS 9

Energy Conservation Building Code (ECBC) – compliance approaches – ECBC guidelines on building envelope, HVAC system, service hot water, water pumps – energy consumption in escalators and elevators – building energy management systems – star ratings – energy efficiency measures in AC and lighting system.

UNIT V ENERGY SAVINGS IN UTILITIES 9

Introduction to compressed air system components – heat transfer loops in refrigeration systems –standards and labelling of room air conditioners – introduction to fans, blowers and compressors –types of pumps, pump curves – efficient operation of pumps – components of cooling towers and its efficient operation – introduction to DG set system. Energy efficiency and energy savings in compressed air system, HVAC system, fans and blowers, pumping system, cooling towers, and DG sets.

Lecture: 45; Tutorial: 0; Total: 45Hours

TEXT BOOKS:

1. "General Aspects of Energy Management and Energy Audit", Bureau of Energy Efficiency, Fourth Edition, 2015.
2. "Energy Efficiency in Electrical Utilities", Bureau of Energy Efficiency, Fourth Edition, 2015.

REFERENCES:

1. Chakrabarti A, "Energy Engineering and Management", PHI, 2011.
2. Murphy W R and McKay G, "Energy Management", Elsevier, 2009.
3. Rajput R K, "Utilization of Electrical Power", Lakshmi Publications, 2006.
4. Frank Kreith and D. Yogi Goswami, "Energy Management and Conservation Hand book", CRC Press 2007.

U19EE701 POWER SYSTEMS LABORATORY 0 0 4 2

COURSE OUTCOMES:

At the end of this course, students will be able to,

1. Evaluate line parameters, network matrices, power flow solutions and symmetrical fault.
2. Solve problems in Unsymmetrical fault, stability; Characteristics of MCB & MCCB and bus bar Protection using relays.
3. Develop parallel operation of alternators using synchronization relay; Examine various parameters of relays and testing of transformer oil break down voltage.

CO / PO, PSO Mapping

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	3	2	2		2	2	2	3	2	2
CO2	2	2	2	1	3	2	1		2	2	2	3	3	2
CO3	2	2	1	1	3	2	2		2	2	2	3	3	2

LIST OF EXPERIMENTS

1. Computation of line parameters.
2. Formation of network matrices (Y_{bus} and Z_{bus}).
3. Power Flow Analysis: Solution of Power Flow Using Gauss-Seidal Method.
4. Symmetrical fault analysis.
5. Unsymmetrical fault analysis.
6. Transient and small signal stability Analysis: Single Machine Infinite Bus System.
7. Time line characteristics of MCB and MCCB.
8. Stimulation of bus bar protection using differential relay.
9. Parallel operation of alternators using synchronization relay.
10. Testing of transformer oil break down voltage (BDV)
11. Determination of various parameters of contactors and relays.
12. Stimulate a fault and analyse the functions of power system using relay.

Total: 60 Hours

U19GE701 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OUTCOMES:

At the end of the course, the student will be able to

- Identify the core values that shape the ethical behavior of an engineer.
- Analyze and practice engineering ethics in their profession.
- Apply codes of ethics in the context of social experimentation.
- Explore various safety issues and ethical responsibilities of an engineer.
- Adopt ethical practices pertaining to global issues.

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	2	1	1	1	1	2	3	3	3	2	2	3
CO2	2	1	1	1	2	2	3	3	3	3	3	3
CO3	2	1	3	1	2	3	3	3	3	3	3	3
CO4	2	1	3	1	1	3	3	3	3	2	3	3
CO5	2	1	3	1	1	3	3	3	3	3	3	3

UNIT-I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT -II ENGINEERING ETHICS 9

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Profession and Professionalism – Professional Ideals and Virtues –Theories of Right action- Self Interest- Customs and Religion-Uses of Ethical Theories.

UNIT-III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Contrasts with standard experiments- Engineers as Responsible Experimenters – Importance and limitations of Codes of Ethics - Industrial Standards - A Balanced Outlook on Law – Industrial Standards- Case Study: Space shuttle challenger disaster.

UNIT-IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Types of risk - Assessment of Safety and Risk – Risk Benefit analysis-Reducing Risk – Case Studies - Chernobyl and Bhopal plant disaster.

Collegiality and Loyalty –Respect for Authority- Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Importance and consequences of whistle blowing - Professional Rights – Employee Rights – Intellectual Property Rights (IPR) and its components– Discrimination.

UNIT-V GLOBAL ISSUES 9

Multinational Corporations – Environmental Ethics – Computer Ethics and Internet- Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Participation in professional societies- –Code of Conduct – Corporate Social Responsibility.

Lecture: 45, Tutorial: 0, TOTAL: 45 Hours

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, Indian Edition, Tenth reprint, 2017.
2. Professional Ethics and Human values- Sonaversity, Edition 2018.

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 2012.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2016.
3. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.
4. R.Subramanian, "Professional Ethics ",Oxford University Press , Second Edition, 2017.

5/7/2022

Member Secretary-Academic Council
SONA COLLEGE OF TECHNOLOGY
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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VIII Regulations 2019
Branch: Electrical and Electronics Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Practical							
1	U19EE801	Project Work	0	0	24	12	360
					Total Credits	**12**	

Approved By

Chairperson, Electrical and Electronics Engineering BoS
Dr.S.Padma

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electrical and Electronics Engineering, Eighth Semester BE EEE Students and Staff, COE